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Editor—HENRY E. SIGERIST

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CONTENTS

Dr. William Charles Wells and His Contribution to the Study of Rheumatic Fever: HARRY KEIL 789

Guillaume Rondelet: JANE M. OPPENHEIMER 817

Index of Names 885

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DR. WILLIAM CHARLES WELLS AND HIS CONTRIBUTION TO THE STUDY OF RHEUMATIC FEVER

HARRY KEIL, M. D.

"And I take up this subject, not as a piece of irksome drudgery, but as a labor of love. I had just finished reading, when I prepared this sketch, for the first time, the volume which contains the record of his life and the results of his labors; and my mind had been so interested and my feelings so warmed by its perusal, that the business before me became a pleasure, and not a task. I cannot doubt that I shall awaken in your bosom emotions and sentiments corresponding in some degree to those which have been kindled in mine."

ELISHA BARTLETT, "A Brief Sketch of the Life, Character, and Writings of William Charles Wells." An Address delivered before the Louisville Medical Society, December 7, 1849.

Dr. William Charles Wells was born in Charleston, South Carolina on May 24, 1757. He received his preliminary schooling and medical education in Edinburgh. Owing to his steadfast loyalty to the King, he refused to remain in the United States; he practiced in London until his death on Sept. 18, 1817. Concerning the available intimate details of his life, there is a valuable autobiography (1) dictated during the last weeks of his fatal illness. This sketch, published posthumously, is remarkable for the frank, fearless, self-analytic manner in which it was written, and it has furnished most of the source material for the accounts of his life by Bartlett (2), Chaplin (3), and Pleadwell (4). Wells was an isolated figure, a sensitive man with unalterable convictions of duty, devotion, fair-play, and ethics, a scientist of unusual originality and attainments,

and an able, observing, level-headed practitioner who made many outstanding contributions to clinical medicine. It is, for example, little known that " it was Wells who prepared the ground " for the subsequent classical work on kidney disease by Richard Bright. Wells was thoroughly grounded in the classics and an excellent Latin scholar. " In the literature of his own tongue he was widely read, and as a writer of vigorous and even elegant English it may be doubted whether he had a superior in the medical profession." (Chaplin). His scientific articles were lucid, informative, carefully compiled, and conservatively expressed. The several obituaries written by him were marked by candor, ability to judge and to give credit whole-heartedly, and by splendid diction; his tribute to William Heberden, the Elder, from whom he never received any favors, is one of the finest in the English language.

It will seem incongruous that a person equipped with such qualities was destined to great disappointments; yet, this may be explained by several circumstances. He was poor, and his medical practice was never lucrative, this being regarded by some as evidence of failure in the profession. He was an American by birth, though every act in his life showed clearly that he was not in sympathy with the " rebels." Owing to financial difficulties, he was unable to afford fineries of dress and carriage, and his dry manners and lack of finesse made him appear uncouth. On several occasions, without thought or hope of personal gain, he took up cudgels in defense of his friends. He was irritable, hypersensitive, introspective, and unwilling and unable to flatter. He was courageously outspoken in matters of injustice and, thereby, offended those in medical power. Yet, among his few but close friends were men like Pitcairn and Baillie, who referred patients to him and who proposed him for fellowship in the Royal College of Physicians at the risk of departing radically from the strict, ultra-conservative rules of that body. Directly or indirectly, Wells was responsible, more than any other person, for the reforms and investigations into conditions of medical education and the restricting practices of the Royal College of Physicians; proof of this may be found in the illuminating documents published in 1834 by the Select Committee on Medical Education under the competent and impartial leadership of Henry War-

burton, Esquire (5). Throughout the first volume of the report dealing with medical practices, the name of Wells was mentioned scores of times. To the credit of the fellows and of others who testified, it was conceded that he was "a person of the highest honour and character" (Sir Henry Halford), that he was "equally distinguished in general science and in medicine . . . one of the first physicians" (J. Sims), and that "no one in modern times in this country has been superior to him" (J. Elliotson). Only Dr. William Macmichael attempted to belittle the position of Wells by denying that he was an eminent physician, by harping on his irritability, by stressing his lack of financial success, and by calling him a philosopher, rather than a physician. Under close questioning Dr. Macmichael admitted that he had not known Wells personally and had not read any of his papers and, further, made the erroneous statement that the works of Wells had not been quoted extensively. When it was shown by Warburton that Wells had written some 18 articles on medical subjects, Dr. Macmichael remarked: "There is one paper I do recollect, which is a very important one, that on the Rheumatism of the Heart; all the others are such as the magazines and the publications of the present day abound with. . . ."

It seems remarkable that, of all the medical investigations conducted by Wells, this paper alone should have been recalled, and it is with the analysis of this contribution that the sketch will be concerned. To the present observer who has the advantages of such delicate instruments as the electrocardiograph and the fluoroscope, this piece of research, chiefly clinical in type, will seem the more noteworthy as Wells lacked the stethoscope, the clinical thermometer, and, at times, even a watch. To all this may be added the hindrances imposed by poor health and the comparatively wretched pecuniary returns from his practice.

From an historical point of view, Wells' article on rheumatism of the heart occupies a special niche owing to its publication just prior to the invention and popularization of the stethoscope. In 1816 it was deemed worthy to be translated into the German language; Kreysig (6) who at that time was considered the foremost German authority on heart disease, regarded the cases recorded by Wells as instances of "gouty heart" because of the periodic recur-

rences of symptoms exhibited by many of the patients. Three years later, Laennec published his classical treatise on Mediate Auscultation (1819), introducing the recently-invented stethoscope. Interest in cardiac disease, which had previously received great stimulation from the outstanding work of Corvisart (1806) (7), now became widespread and within a short time there appeared an extraordinary number of texts and articles relating to heart disorders. To the popularization of auscultation may be attributed, in large measure, the onset of a new era in the study of rheumatic fever, particularly because the occurrence of valvular murmurs was drawn to the attention of the profession, leading to closer inquiries into the state of the interior of the heart, both clinically and at postmortem. The reintroduction of percussion by Corvisart (1806, 1808), although of great moment, was apparently less productive of significant advances in the formulation of ideas on rheumatic fever. It is my purpose to trace the major steps contributory to the evolution of a conception of this malady prior to the publication of Wells and to review the knowledge immediately available to him by virtue of the labors of his contemporaries.

To discuss the individual merits of all the pioneers in the development of the conception of rheumatic fever would require unusual familiarity with archaic texts and the few available fragmentary writings; rather, it will be more profitable and instructive to take cognizance of broad and general trends. It is when we divorce objective observation from pedantic speculation that the old masters appear at their best. Many of our so-called modern beliefs are in reality ancient ideas clothed in fresh garb, a new term substituted for an old one. Nowhere in medical history, with the possible exception of dermatology, has nomenclature been more important for the stimulation of fresh thought, an apparently minor change in the meaning of terms, both medical and vernacular, infusing vital energy into studies and hypotheses already stagnant. The remarkable feature is that, despite the many errors perpetuated by eminent authorities, the conception of rheumatic fever continued its inexorable advance.

From the beginning of scientific medicine which originated with the Greeks, the concept of arthritis (roughly corresponding to rheu-

matic arthritis) was indissolubly bound with that of podagra, the ancient term for gout. With the emergence of the shadowy figure of Hippocrates (ca. 400 B. C.), the religious and mystical practices of antecedent times were replaced by the more precise method of daily and objective observation; the infallible cures of the Gods gave way to the realization of the fallibilities of Medicine and of the enormous gaps in knowledge. Without reading too much into the available writings of Hippocrates or of the putative works originally credited to him, it appears that, on clinical grounds, podagra was definitely and clearly demarcated from arthritis, the latter corresponding in great part to rheumatic articular disease. There are fragmentary descriptions of what seems to correspond to "deforming arthritis" and to our equally vague "muscular rheumatism" (Delpeuch) (8). To understand the origin of the term rheumatism, it is necessary to go back to the humoral conception of disease held by the ancient Greeks. It had been noted, on the basis of clinical observation, that certain disorders were characterized by mobility, transiency, and recurrences; the ancients concluded, with some justification, that these attributes were dependent on the movement of a fluid or humor from place to place. The term catarrh was used to indicate a humor formed in excess and flowing outside and beyond the natural channels ordinarily reserved for it. The brain was considered the center of production of phlegm (a type of catarrh or humor) by a process analogous to detoxification, and it was natural to assume, on the basis of meager knowledge, that this mysterious organ governed or influenced or modified the nature of phlegms manufactured elsewhere in the body as well as within its own structure. It was believed that catarrh was evolved in the encephalon in its definitive form, being then conducted to the lower extremities and other parts and lodging at points of lowered resistance. The term rheumatism (fluxion) was not used to designate a specific disease but was employed synonymously with catarrh; some physicians even applied the name to all types of "effusions," including urinary and faecal incontinence and, hence, there were many varieties of rheumatism. Hundreds of years had to elapse before the term acquired a more restricted meaning.

Of such a character was the contribution of Greek medicine to the

formulation of a conception of articular disease; its importance lay in the introduction of clinical observation. The differentiation of podagra (gout) from arthritis (" rheumatism ") was continued by the Alexandrian school (ca. 300 B. C.) but, despite the advantages of a liberal attitude towards public dissections and autopsies, there was no further clarification of ideas relative to articular disorders. With the gradual decadence of this school, the center of medicine shifted to Rome and, although one speaks of Grecian influence in its early history, and, although the writers of the period frequently invoked the authority of Hippocrates, the fundamental approach of Greek medicine was misunderstood, misinterpreted, or replaced by personal systems of retrogressive trend. Aretaios of Cappadocia (latter half of the first century), Soranus of Ephesus (second century), and Galen (middle of the second century) all confused articular disease with podagra under the comprehensive title of arthritis, or, as expressed in the Latin equivalent, morbus articularis (Delpeuch) (8). Rhuphos of Ephesus (beginning of the second century) had, in the interim, introduced the idea of metastatic or visceral podagra; this conception was hardly appreciated by his contemporaries, but in later years it influenced all thought relative to the systemic aspects of articular disease. Galen promulgated a well-defined arbitrary system of four humors, corresponding to archaic notions of " primary elements " and " primary qualities " (Neuburger) (9); these views need not be discussed, save to mention that the relatively simple humoral conception of Hippocrates was now replaced by a more complicated system having for its object the task of correlating the entire field of medicine. Since human minds are frequently attracted by specious dialectics, particularly when clothed in dogmatic form, the course of medical progress was halted for almost 1500 years, through no direct fault of Galen. The prohibition of postmortem examinations was continued by the Moslems and during a great part of the early Christian era. Until the arrival of the Renaissance, Galen represented the ultimate in medical practice and theory. The only outlet available was that of animal dissections and, what was worse, metaphysical disquisitions. During this intervening period, the term morbus articularis was applied by some to a heterogeneous group of acute and chronic disorders of

joints, excluding podagra. The Byzantine writer, Demetrios of Pepagomenos (latter part of the thirteenth century) had noted that "gouty fluxion" could be carried to the brain, liver, and heart; furthermore, he stated that, if the accumulation of wastes was too great, death might result (Delpeuch). A representative of the Salernitan school, Archimatheus, had, about the year 1270 A. D. (?), used the term gutta or gout in the sense of a humor flowing to a part drop by drop. Somewhat later, others applied the designation in a sense similar to the "arthritism" of the nineteenth century, expressing thereby the notion of a "gouty state" characterized by recurrences and paroxysms. In the vernacular the term was used to indicate all forms of humoral fluxions or catarrhs, whether of the chest or any other part, in a manner distinctly reminiscent of the meaning applied to rheumatism during the Hippocratic era. During the Renaissance the term gout became a popular medical name for a general diathesis; one spoke of arthritic gout, gouty podagra, gouty sciatica etc. Although ideas relative to these disorders were in a muddled state, there were occasional observers who seemed to understand the distinction between podagra and morbus articularis. For example, Cardan stated that the former was an affection of the blood itself, thereby vaguely intimating a metabolic disorder, whereas the latter was considered, in contradistinction, as dependent on "septic" alteration of the blood (Delpeuch). Mercatus (1620, posthumously) discussed the differential diagnosis in most modern manner and clearly differentiated sciatica.

In 1591 Baillou (Ballonius) promulgated views on rheumatism but these principles became available for the first time in 1643 (posthumously). This observer was responsible for a complete upheaval and reversal in meaning of medical terms as applied to articular disorders. Fernel (1554) had already laid the groundwork for withdrawal from well-established theories when he wrote of catarrh as manufactured, not in the brain, but in the external portions of the head outside the skull, the superfluous fluid coursing over the body underneath the skin (Delpeuch) (8). From this denial of the origin of catarrh in the brain itself, Baillou went a step forward by substituting the idea of a *generalized* humoral disorder or rheumatism, involving not only the joints, but also the

external parts of the body and the continuity of the limbs. He discarded the terms podagra and gout, replacing them by the general designation arthritis which, in contrast to rheumatism, represented a purely local process. The generalized disorder rheumatism, though clearly separated from arthritis (gout), comprised a heterogeneous group of maladies. Despite the confusion created by Baillou and despite the overlooking of excellent prior work on articular disorders, he rendered definite service in establishing and popularizing, owing to his influence and reputation, the conception of a generalized disease rheumatism, based on a modified form of humoralism. So far as the history of rheumatic fever is concerned, Baillou represented the last great humoralist. In 1660 Conrad Victor Schneider completely refuted the conception of catarrh of the brain in his painstaking work on the nasal membranes, destroying the last vestiges of Galenic theory.

Sydenham's observations on arthritis marked the end of the archaic humors, for he expounded at length on external exposure as the cause of rheumatism. Contrary to Baillou, he emphasized the arthritic localization of the process instead of including the continuity of the limbs. Moreover, his wide clinical knowledge of gout enabled him to differentiate this disorder from rheumatism, the latter term embracing a number of diverse conditions. Sydenham's extraordinary clinical acumen, to which Boerhaave later paid homage, included recognition of the principal features of acute articular rheumatism but, owing to his disregard and neglect of morbid anatomy, he seemed to be unacquainted with the conception of "translation" to various internal organs. In 1686 he graphically portrayed the clinical features of chorea but it appears that there was some confusion with epidemic St. Vitus Dance; it required over one-hundred years before these states were satisfactorily differentiated by Bouteille (M. P. Jacobi) (10) and only by the middle of the nineteenth century was the relation of chorea minor to rheumatism discussed definitively.

Towards the close of the seventeenth and continuing uninterruptedly through the eighteenth century, there followed in rapid succession a line of illustrious pathologists (Lancisi, Vieussens, Morgagni, Cowper etc.). These observers described various de-

formities of the valves of the heart and appeared to have understood something of the attendant clinical phenomena caused by, or consequent upon, these alterations; for example, the pulse of aortic insufficiency was dramatically described by Vieussens (1695), antedating by some 100 years the more accurate and comprehensive report of Corrigan. The occurrence of mitral stenosis was recorded by Vieussens and also by Morgagni (1761). Paricarditis had been noted by many observers (Benivieni, Sénac, and others) in the routine of performing autopsies which were principally of a medicolegal nature; there were occasional physicians who seemed to be able to diagnose "dropsy of the pericardial sac" intra vitam (Auenbrugger) (11). During this time an abortive attempt was made to correlate these findings with clinical symptoms, little being known of the etiologic factors in the causation of both the valvular deformities and pericarditis. Nevertheless, knowledge of pathology was steadily increasing owing to the work of Morgagni who showed the importance of securing postmortem examinations and of making careful complete records of the pathologic alterations observed at necropsy. In short, Morgagni introduced the "anatomical concept" into the practice of medicine. Normal anatomy which had received its most potent impulse from Vesalius and which, having been the chief concern of physicians, had attained an amazing state of development, now began to give way to studies on abnormal or morbid anatomy.

According to the excellent account of Messeloff (12), there were occasional observers in the eighteenth century, who seemed to suspect the occurrence of visceral complications in rheumatism. Among these may be mentioned Boerhaave, Störck, and van Swieten, but reference to the quoted fragments of their works reveals a surprising absence of knowledge relating to cardiac lesions. William Cullen who made his mark as an outstanding clinician and inspiring teacher denied the "recession" of rheumatism into the internal organs (13). However, his description of rheumatic articular disease deserves to be quoted for its lucidity; the attributes of transiency, recurrence, lack of suppuration, predilection for large joints, and failure to result in permanent damage were known to him. He differentiated acute from chronic rheumatism and recognized the

difficulties in classifying transitional cases. The aforementioned peculiarities of rheumatic inflammation were puzzling to him, as they still are to modern investigators.

In 1793 Baillie's book on morbid anatomy was published and in 1797 a second edition of it appeared (14). To this volume, written by a keen clinician with major interest in gross pathology, Wells was undoubtedly indebted for his postmortem knowledge. In the first edition there was an accurate account of the developmental stages of pericarditis, the principal criterion for the diagnosis of heart disease at necropsy. Concerning valvular affections, little of genuine importance was recorded. Baillie did, however, mention calcification of semilunar leaflets of the aortic valves as well as thickening of the mitral cusps and of its chordae tendinae. As to acute or fresh inflammation of the mitral valve, " covered with a layer of coagulable lymph," he believed this finding to be *very uncommon.* No reference was made to rheumatic heart disease as an entity. In the second edition of this book, specific mention of which was made by Wells in his article, Baillie stated, on the authority of David Pitcairn, that: " The causes which produce a morbid growth of the heart are but little known; one of these would seem to be rheumatism attacking this organ." It will be seen, therefore, that the criteria postmortem for the recognition of cardiac disease now appeared to rest on the occurrence of pericarditis and enlargement of the heart; knowledge of valvular alterations was still fragmentary. From descriptions that are available and in the light of modern views on rheumatic fever, it seems likely that observers were often content with gross superficial examination of the external aspects of organs; they frequently failed to inspect the interior of the heart and paid but scant attention to the state of the valves except in occasional instances where clinical symptoms pointed unmistakably to interference with circulation. For example, Alan Burns (1809) described several instances of " tight " mitral stenosis, adding an excellent discussion of the mechanical physiological principles involved in valvular obstruction; among other observations, he pointed out the marked tendency to pulmonary hemorrhage, the " imperfect arterialization of the blood," and the frequent termination in dropsy (15). However, he knew little of rheumatic heart disease as

an independent entity. In the same year (1809) Abernethy published observations on two cases of "button-hole" mitral stenosis with death from heart failure (16). That investigators were beginning to understand pathologic anatomy in terms of physiology and clinical medicine may be gleaned from the following comments made by Abernethy: "In such cases there existed a great mechanical impediment to the circulation of blood, producing considerable enlargement of the left auricle and a proportionate diminution in the capacity of the left ventricle." Abernethy was, however, more concerned with anatomico-physiologic principles than consideration of etiology and could hardly, considering the state of knowledge in his time, have suspected the rheumatic nature of his group of cases; nor was he prepared to elicit and to recognize the importance of a previous history of "rheumatism" in the manner first achieved by Bouillaud (1836) (17). Corvisart's amazing exposition of the physiologic principles involved in valvular obstruction and other disorders of the heart (1806), so far ahead of Continental medicine, had not yet reached English physicians. Occasional clinicians were, however, now beginning to realize that the term "rheumatism" embraced a heterogeneous group of diseases, and in 1805 Haygarth voiced this opinion when he stated that, "The term rheumatism, both in common and medical language, includes a great variety of disorders which ought to be distinguished from each other by different names." (18). He stressed the point that his cases of "rheumatick fever" differed from gout and certain forms of rheumatism (the latter being exemplified by "Haygarth's Nodosity" or the bony protuberances of rheumatoid arthritis). Curiously enough, he made no mention of rheumatic heart disease, the importance of which was later to be emphasized by numerous observers as one of the fundamental hallmarks in the differentiation of other varieties of "articular rheumatism."

With the publication of Corvisart's "Essay on the Organic Diseases and Lesions of the Heart and Great Vessels" (1806), tremendous impetus was given to detailed studies on cardiac disorders and the author of this monumental treatise might with some propriety be designated the first great heart specialist. His influence was, however, exerted chiefly on the French school, hardly reaching

the remainder of the Continent; it is interesting that an American edition of this work was published in 1812 under the supervision of Jacob Gates, antedating the English and German translations by one and two years respectively. The art of percussion which had been lying dormant since 1761, was resuscitated by Corvisart, acquiring fresh energy under the precept of this leader in French medicine (1808). Corvisart introduced the term "organic disease" in relation to cardiac disorders and he stressed the sero-fibrous nature of the heart valves, a point later used by Bouillaud in the enunciation of the famous "law of coincidence of endocarditis and pericarditis with acute articular rheumatism." This represented a fundamental elaboration of the principle implied by Bichat (19) when he classified the serous and synovial systems as related tissues with predilection for similar diseases. Corvisart's description of vegetations on the valves was, on the whole, accurate; he recognized their verrucous appearance and, on the basis of analogy to venereal excrescences, attributed them to syphilis. This hypothesis required some 20 years before Bertin (20) and Andral (21) half-heartedly took issue with it and an additional 10 years before Bouillaud denied it most vehemently. It will be seen, then, that one of the great masters of French medicine in the early part of the nineteenth century was quite unfamiliar with the conception of rheumatic fever. It is likely that Wells was not acquainted with the fundamental observations of Bichat and Corvisart, for his writings contain no references to the French literature except what was available in English translation.

It is little known that on July 29, 1789 Edward Jenner had "favoured the Society (The Fleece or Glouchestershire Soc.) with Remarks on a Disease of the Heart Following Acute Rheumatism, Illustrated by Dissections." This report was never published and, unfortunately, the original copy appears to have strayed or been lost (Messeloff) (12). To Dr. Jacobs we are indebted for preservation of a letter (22) written by Dr. Jenner to Dr. Parry on Jan. 10, 1805, in which the following interesting comments are found: "A neighbor of mine died yesterday from a disease of the Heart, which followed two or three attacks of acute Rheumatism. You may probably remember a paper of mine that was given into the Fleece

Med. Soc'y on this subject." That Jenner's knowledge on this subject was more than fragmentary may be gathered from his concluding sentence in which he requested the return of his paper . . . " as I am confident many a life is lost by not shielding the Heart at the going off of acute Rheumatism, which not infrequently at that time fills a morbid determination of blood. . . ." Considering the reputation of Jenner as a pathologist, it seems probable that his paper contained information of great importance. However, Wells was unaware of the existence of this communication and it seems to have been overlooked entirely by Jenner's contemporaries, so that there are no means by which to judge its historical significance.

In 1808 Davis (23) published a small book on the subject of Carditis, a term used to indicate all types of pericarditis as well as abscess of the myocardium. Baillie had recognized that in pericardial inflammation there was more or less extension into the outer layers of heart muscle. In common with this view, Davis discussed Carditis as an affection of both tissues, considering the signs proper to each as clinically indistinguishable. It is interesting that de Sauvages (1763) was apparently one of the first to suspect, on insufficient grounds it is true, that pericarditis and carditis (in the sense of myocardial involvement alone) could be differentiated, and he classed the former disorder as a species of pleuritis (24). The term Carditis was, therefore, buried in a haze of obscurities, from which it did not emerge clearly until the publications of Krehl (1890) and Romberg (1894) and the pathologic discovery of the Aschoff body (1904). Particularly noteworthy in Davis' book was the appended report of three cases of rheumatic fever, in which the joint pains were trifling in severity; for this reason, the rheumatic etiology of the group was denied by Davis who, however, stated: " It has been suggested to me by an intelligent and experienced physician (Dr. Sherwen, late of Enfield) that all the cases were probably varieties of acute rheumatism attacking the heart. . . ." We shall see that Wells recognized the rheumatic nature of these examples of the disease, correctly interpreting the mild pains as manifestations of rheumatic articular disease; wherein this was important will be pointed out subsequently.

The last major contribution with which Wells was acquainted was

the excellent article by David Dundas * on "An Account of a Peculiar Disease of the Heart" (25). This paper received many citations from contemporary writers and, aside from failure to credit prior observers, it deserved recognition because it called to the attention of physicians this "hitherto undescribed disease." In view of an experience of nine cases in the course of 36 years of practice (sic), it was Dundas' belief that the disorder was not uncommon. He made some interesting observations indicating a keen clinical sense; thus, he wrote: "In some cases I have found the action of the heart so very strong as to be distinctly heard, and to agitate the bed the patient is in so violently, that the pulse of the patient could be counted by looking at the motions of the curtains of the bed." He recognized that the disease affected chiefly young adults, only two of the nine examples recorded in his original communication being above 22 years of age; and he mentioned the clinical signs of congestive failure ushering in the terminal stages of the disease. In all the cases cardiac involvement succeeded one or more attacks of rheumatic fever, by which he meant, as did most of his contemporaries (Haygarth for example), the combination of generalized articular disease with that conglomeration of symptoms included under the broad concept of Fever. In six instances studied postmortem, the criteria for the diagnosis of heart disease were fulfilled, namely, pericarditis and enlargment of the heart. In one case Dundas recorded that the "valvulae mitrales were edged with a substance of a spongy appearance, perhaps coagulable lymph," but he knew little beyond what is implied in that description. He concluded: "The knowledge that this disease is always the consequence of, or is connected with, rheumatic affection points out the necessity of attending the translation of rheumatism in the chest . . . but whenever it has made any considerable progress I fear it will baffle every effort." It was Bouillaud who was later to take issue, rather severely, with the promulgation of such concepts as translation of, retrocession of, repercussion of, transfer of, metastasis of, and flying of rheumatism to the heart, notions which owed their origin partly to the archaic ties binding rheumatism and gout, and partly

* Wells was of the belief that Dundas was acquainted with the statement on this subject found in the second edition of Baillie's Morbid Anatomy.

to the temptation to seek analogies with " retrocedent " gout. It appears that Bouillaud was not acquainted with the paper of Wells, in which this error was, for the most part, assiduously avoided.

On April 3, 1810 Wells (26) read his paper before the Society for the Improvement of Medical and Chirurgical Knowledge. In contrast to the report of Dundas, this article was a scholarly presentation of personally observed cases of rheumatism of the heart, coupled with an excellent review and accurate classification of instances found in the antecedent literature. For the first time the designation " rheumatism of the heart " appeared in a title. Two outstanding attributes of the man are clearly discernible from perusal of the article; first, the uncommon gift of gratitude, manifested by sincere acknowledgment of his debt to Dr. David Pitcairn to whom he gave full credit for the formulation of the conception denoted by the title of the paper. Wells apparently little realized that it was he who in reality was giving form and substance to this new conception, for there were recorded additional data, the significance of which was overlooked completely by his contemporaries. Second, the paper revealed the cold sober methodical manner in which clinical and pathologic observations were reported, a characteristic of the man even more strikingly reflected in his previous fundamental work on single vision (1792, 1811), the discovery of albumin and blood in the urine (1806, 1811), the clinical features of scarlatinal " dropsy " (1806), and continued subsequently in his work on the formation of Dew (1814) which earned for him the Rumford Medal.* Wells wrote deliberately, with his feet on solid ground, wholly devoid of the emotional and brilliant flurries that marked the genius of Bouillaud; unlike the latter, his work was free of gross patent errors. That is why so little of what was recorded by Wells required revision at the hands of later observers. This is the more noteworthy since there were ample opportunities for confounding rheumatic disease with a host of other disorders present-

* Charles Darwin in a letter to Sir J. D. Hooker (1865) recognized that Wells had been the first to enunciate the principle of Natural Selection, anticipating him by almost 50 years; it is, however, fair to state that partial anticipation and complete development of a concept are not quite the same, despite the modesty and generosity of Darwin.

ing similar features, an error from which even the great Bouillaud did not escape.

For the purposes of analysis, it will be convenient to discuss the contribution of Wells under the following three headings:

1. His conception of rheumatism of the heart; the unity of his group of cases and those culled from the literature; the advances made over his contemporaries.
2. The first description of the subcutaneous nodule of rheumatic origin and brief mention of other cutaneous manifestations.
3. Other interesting miscellaneous points.

1. Conception of Rheumatism of the Heart:

The story of how this subject was originally directed to Wells' attention is illustrative of his method and manner of approach; it may best be told in his own words describing the first case seen by him in April 1798. "At his first visit I did not become acquainted with all the circumstances which I have mentioned; and as I found his pulse frequent and tongue white, and was told by him that he was worse every other day at ten o'clock in the forenoon, I thought it probable that his disease was a tertian fever, which had not yet fully intermitted. As I learned, however, when I saw him next, that the beating in the chest was never absent, though at some times greater than at others, and that he had been much subject to rheumatism, I began to suspect that his disease might be rheumatism of the heart, of which I knew nothing beyond what I had learned from Dr. Baillie's publication.* I carried him therefore to Dr. Pitcairn who confirmed my conjecture and was fearful that he would not recover."

Following this observation, Wells encountered additional examples of the disease and in the course of several years prepared his paper. In the introduction to the paper, the new conception was formulated in such manner as to leave no room for doubt relative to the views underlying it. The opening paragraph of his article reads: "Dr. David Pitcairn, about the year 1788, began to remark

* This is the single line quoted on page 798 of this article.

that persons subject to rheumatism were attacked more frequently than others, with symptoms of an *organic* disease of the heart. Subsequent experience having confirmed the truth of this observation, he concluded that the *two diseases depend upon a common cause* and in such instances, therefore called the latter disease rheumatism of the heart. He communicated what he had observed to several of his friends, and to his pupils at St. Bartholomew's Hospital, to which he was then Physician; but no notice, I believe, was taken of his remark in any book, before it appeared in the second edition of Dr. Baillie's Morbid Anatomy which was published in 1797. No similar observation, as far as I know, is to be found in any book before that time. Morgagni, indeed, and Dr. Ferriar of Manchester, had given cases of rheumatism existing with an organic disease of the heart, but it is evident that they considered the concurrence of the two diseases as merely accidental; and it is very probable that similar cases occur in other authors who wrote before Baillie, though I have not met with them."

It is clear, then, that the conception of "translation of rheumatism to the chest" had been vitally changed into one where the two disorders depended "upon a common cause," a point of view agreeing essentially with the fine distinction that Bouillaud was to establish subsequently with the enunciation of the "law of coincidence" (1836). That this conception was far ahead of the times may be gathered from the comparatively few references to Wells' article by his immediate contemporaries who were utterly unprepared for it. Thus, Kreysig, the foremost representative of the German school of cardiology, classified some of Wells' cases in the category of Gout, for reasons already detailed. Scudamore (27), who in his treatise on the nature and cure of rheumatism, quoted the paper of Wells in extenso and abstracted all his cases, still spoke of "metastasis" or "transfer" of rheumatism to internal organs and, moreover, was still inclined to view the occurrence of both affections as coincidental and unrelated. In general, chauvinistic Europe had not heard of Wells; for example, Mathey (28) writing on rheumatism of the heart (1815) did not cite the prior observations of Wells. Even as late as 1840 Bouillaud, in his classic monograph on acute articular rheumatism, mentioned only Dundas of all

the English writers, and he did not seem to realize that this observer had promulgated views on "translation" which he had taken particular pains to refute.

That the eleven personally observed cases detailed by Wells were truly examples of rheumatic fever in its modern sense may be inferred from the following evidence:

1. All the patients were afflicted with genuine rheumatic articular disease; they were all young adults in the second and third decades of life with but one exception, a man 36 years of age.
2. The clinical symptoms and manifestations pointed clearly to involvement of the heart; the patients suffered from "a sense of oppression and pains in the chest, great and indescribable anxiety in the chest, breathlessness, marked palpitation, a sense of choking, heart beating with considerable violence" etc.
3. In several instances there was confirmation postmortem in the form of fresh and old pericarditis, and enlargement of the heart; the importance of verrucous endocarditis was not appreciated by Wells or any of his contemporaries. The crude morphologic conception of endocarditis held by Corvisart (1806) did not come to the notice of English physicians until a translation of his book became available in 1813.
4. In two cases subcutaneous nodules were encountered, concerning the rheumatic etiology of which there can be no doubt.

It will be seen, therefore, that the conception of rheumatism of the heart was evolved on the basis of clinical observation at the bedside and by the use of relatively simple pathologic criteria. The importance of endocarditis (acute and chronic forms) relative to rheumatic fever was first appreciated about 25 years later by Bouillaud, but this correlation had necessarily to await the advent of stethoscopy. Thus far, the conception required acute articular rheumatism as one of the principal criteria, but we shall see that Wells, without perhaps realizing it, made initial steps away from the obligatory nature of this symptom.

It is of great interest that in the preparation of this paper, such men as David Pitcairn, Mathew Baillie, William Lister, and Benjamin Collins Brodie contributed either inspirational stimuli or actual case reports or both. Supported by such eminent authority, coupled with an intelligent collection of the literature, the article by Wells represented an oustanding contribution; in this manner he was able, not only to credit other observers, but also to add prestige, dignity, and solidity to the conception denoted by the title of the article. It must not be thought, however, that in reviewing the work of others, no important cases of rheumatic heart disease had been overlooked. This could hardly be avoided, considering that the association of acute articular rheumatism with evidence of heart involvement was required (cases of Crowfoot, Wagstaffe, Brodie, Lister, and Baillie) (26). On this basis, for example, Wells included but one of the several examples of "button-hole" mitral stenosis recorded by Burns (15), in which particular instance there was available a previous history of articular rheumatism; the inclusion of the remaining cases described by Burns is a modern contribution to the study of this disease. However, in embracing the three instances reported by Davis, Wells made the first break, unconsciously it is true, with rigid tradition, since in these cases the pains in the joints were so mild and trifling in degree that even Davis excluded them from the category of rheumatism. In another personally observed case cited in a footnote, Wells included a probable instance of rheumatic heart disease terminating in congestive failure, where there had been no antecedent history of articular rheumatism. This was as far as Wells could go, considering the imperfect knowledge of pathology and lack of more precise clinical instruments by which the chest could be explored.

Relative to prognosis, Wells made another unconscious departure from traditional views. David Pitcairn had been fearful that the patient whose history was narrated in case 1, would not recover, a belief that was not substantiated by subsequent events. The opinion of Pitcairn was in keeping with archaic belief that disease of the heart, a rare occurrence according to the ancients, was immediately fatal in all instances. This point of view was founded on occasional postmortem examinations of persons who had died

shortly after inception of disease, particularly of those suffering severe trauma to the chest (medico-legal necropsy). As a teleologic corollary, therefore, the heart was considered as an invulnerable organ free from disorders of any sort under ordinary conditions. So little was known of heart disease in any form (angina pectoris excepted) that this diagnosis belonged to the rarities. It was Corvisart (1806) who first pointed out the frequency of cardiac involvement and, though convinced that complete cure was impossible, he did record instances where recovery was at least transient. Wells also included in his conception several instances of what appeared to be temporary recoveries. In addition, he mentioned, rather briefly, four fatal cases of "peripneumony" succeeding acute articular rheumatism, in one of which pericarditis was noted postmortem. It is difficult to state with any certainty, in the absence of detailed clinical and pathologic data, whether these were genuine cases of rheumatic fever. However, Wells emphasized the point that in several other similar instances he had observed recovery from the acute attack; concerning these cases it is reasonably certain that they were examples of rheumatic fever with probable coincidental pulmonary symptoms. From all this, it may be gathered that the traditional prognosis of invariable and immediate fatal issue to be expected from heart disease was irrefragably refuted by the clinical observations of Wells.

2. Subcutaneous and Cutaneous Lesions of Rheumatic Fever:

Many investigators [de Sauvages (24), (1763); Chomel (29), 1813); Froriep (30), (1843); Jaccoud (31), (1870-71)] have been credited at one time or another with the first description of the rheumatic subcutaneous nodule. It appears, however, from perusal of original works or remarks by their respective contemporaries that the names of these observers cannot be accorded this honor, as they misunderstood the criteria for the diagnosis of rheumatic fever, or furnished inadequate clinical data, or described disease processes unrelated to the rheumatic affection as it is conceived today. To Wells belongs the credit for the original description of this important manifestation which was encountered in patients undoubt-

edly afflicted with rheumatic fever. In his second case, he observed that " many of the tendons of the superficial muscles in this patient were studded with numerous small hard tumours, an appearance I have observed only in one other person, a thin and feeble man forty-one years old, who also laboured under rheumatism." In a cogent foot-note attached to the record of this case, Wells remarked: " Dr. Lister informed me that the superficial tendons of Salmon, the subject of the seventh case in this paper, were similarly affected. As Salmon did not mention this to me, and as I did not discover it myself, the same symptom may have existed in several of my patients, labouring under rheumatism, besides those of whom I have spoken." Wells' original observation was made sometime in 1802; Lister's came in 1808 or 1809. In France these lesions bear the name of Meynet who more than a half-century later (1875) wrote a splendid paper and deduced a relationship to rheumatic fever on the basis of a single case (32). The failure of subsequent writers (Cheadle (33), for example) to credit Wells with the original description of this lesion must be accounted an oversight occasioned by an increasingly voluminous and complex literature which had sprung up in the interim.

It is interesting that Salmon, the subject of his seventh case, also manifested a " rash which occupied various parts of his skin in succession, but was never very extensive, and receded in a week. It had since been several times present for a day, but has not appeared for the last six weeks." From the attributes of transiency and the marked tendency to recurrences, it may be concluded, with reasonable certainty, that the eruption was rheumatic in nature (Keil) (34); the description is, however, unsatisfactory as it is lacking in many particulars, but it must be remembered that dermatologic lesions were first beginning to be studied and classified. For example, Willan's classic treatise (35) on skin diseases which had just appeared (1808), made no reference to rheumatic dermatoses. In 1831 and again in 1839, Bright (36) recorded instances of " roseola annulata " in association with chorea and even at this late date the relation of the dermatosis to rheumatic fever was not fully suspected, least of all its fairly specific character.

In one of his cases Wells noted a " miliary eruption on the neck

and chest," attributing it to "moisture"; the sweat rashes had, however, been more completely recorded by Haygarth (1805) (18).

3. Other Interesting Miscellaneous Points:

a. *Pulse*: The clinical ability of Wells was portrayed by his description of the pulse in several cases. To these powers Scudamore (27), in his treatise on the nature and cure of rheumatism, paid particular tribute when he quoted the observations in full. In the fifth case recorded by Wells, it was noted that "The strokes of the heart were 190 in a minute; they were equal in force, and the intervals which were also equal, were so distinct that I fancied I could have numbered the strokes, if 250, or even 300, had been given at the same time." In this case he also observed that the external jugular veins were swollen and alternately rose and fell. In the seventh case he noted that "The strokes are full, but are easily made to vanish by pressure. Each stroke is given rapidly, as if with a jerk, forming, I think, what Morgagni calls the vibrating pulse; and which so frequently occurs in diseases of the heart, particularly at their commencement and in acute rheumatism."

b. *Response to Exercise*: In two instances Wells mentioned the effects of exercise on the symptoms of the disease. Long after the recovery of his first patient, he was told that exercise was more apt to bring on palpitations than formerly. In his seventh case, seen jointly with Lister, Wells observed that the heart palpitated without causing subjective sensations and that the symptom was not evident when the patient was lying or sitting but could be produced with the assumption of erect posture.

c. *Response to Therapy*: In the evaluation of drugs, Wells was honest and keen. Although he frankly summarized the evidence against the use of repeated bloodletting, he, nevertheless, advocated its use empirically, having been convinced, on the basis of clinical observations, that it was of value. This is one of the very few examples where Wells apparently made an error, but it may be stated that therapeutic fallacies have been shared by many men who have made great names for themselves. Wells, however, never used the extreme method of repeated bleeding, "coup sur coup,"

advocated by many of the ancients, resuscitated by Baillou, and practiced to its extreme by Bouillaud.

Digitalis was also used by Wells in the acute stages of rheumatism, but he saw no particular benefit arising from its employment. In his fifth case, that of a patient who suffered from "a great and indescribable anxiety in her chest," this symptom was always "much lessened by taking a few drops of laudinum and a drachm of vitriolic aether, although no change was ever induced by these medicines on the palpitation."

d. *Congestion of the Liver*: In concluding his paper, Wells noted that the liver was found "diseased" in 2 of the 6 cases examined postmortem. His explanation is interesting: "I had supposed this to arise from the impeded passage of the blood from the vena cava through the heart, and its consequent congestion in the vessels of the liver." He mentioned the belief of Odier who thought that rheumatism could be "translated" from the joints to that viscus and he conceded the possibility of diseased liver attributable specifically to rheumatism. However, in a foot-note he cited an instance which strengthened his former opinion that such disorders of the liver postmortem were in reality the consequence of congested vessels in that organ. It may be mentioned that Corvisart's knowledge in this regard was in advance of Wells', but the point has been discussed briefly as an example of the fact that Wells was continually subjecting his views to further scrutiny, observation and analysis.

e. *Rheumatic Fever of Childhood*: It is a fact worthy of notice that until the middle of the nineteenth century rheumatic fever of childhood could be scarcely said to exist as a clinical entity. Several children were included in the series reported by Wells. However, the important theoretical and practical implications of these observations were not appreciated by him. This was a point that awaited the advent of stethoscopy and, even then, many years elapsed before the idea was clearly formulated.

f. *Methods of Obtaining Postmortem Examinations*: In 1806 Corvisart (7) took issue with his medical colleagues in France for the laxity with which postmortem examinations were obtained and performed. In this connection he wrote the following interesting

comments: "It might be said that they who ordered them (for they were seldom performed by the physicians) were suspicious of not discovering what they had conjectured or what they did not predict. I will say more, because in dissections made here and there in hospitals, I think I have not once seen the scalpel directed to the heart, for the purpose of knowing its internal state, until the author awakened the attention of physicians to the diseases of this organ, and rendered the knowledge of them public and easy." Regarding the failure to inspect the interior of the heart postmortem, this semed to be, with but few exceptions, a common oversight in England during the time that Wells practiced medicine. However, Wells made zealous efforts to secure postmortem examinations; the manner in which one of them was performed (case 5) is noteworthy and the description of the procedings may best be given in his own words: "I had previously requested a friend of the family to apply, when death should occur, for permission to me to inspect the body. Application was accordingly made, and permission obtained. But some mistake was committed with respect to informing me of what had happened; and the weather being warm, and the family anxious to have the examination over, this was performed by the *apothecary* who had attended the deceased, assisted by his partner, and another medical gentleman." Small wonder then that insufficient attention was paid to the state of the valves and that the examination was confined to gross inspection or organs. Finally, in 1824 Forbes (37) wrote words reflective of the general medical lethargy of the times, and, condemning this attitude with respect to postmortem studies, he stated: "The practical conclusion from all this ought to be, not to disregard pathology, but only to cultivate it in a more philosophic spirit. To derive benefit from our dissections, we ought as much to reflect on what was the cause and the early character of the organic change we see consummated, as to study the actual nature and final amount of this change. Without this retrospective ratiocination and practical dedication to his researches, the morbid anatomist is more an artist than a physician; and his science is, to use the language of Bacon, rather idolatry than true worship." Among those who "cultivated pathology in a philosophic spirit" was William Charles Wells. In the Report from the Select Com-

mittee on Medical Education (1834), John Copland (38) characterized Wells as " one of the most original of our pathologists."

From this brief account, it will be seen that Wells, whose medical work never " received the consideration it deserves," was both a keen honest physician of the Hippocratic type and a scientist of the highest attainments. No one can help but admire this isolated figure who, single-handed, struggled against injustice and who subsequently refused to apply for admission as fellow in the Royal College of Physicians when conditions were more favorable. If he possessed qualities unsuited to the upper strata of society, these were more than counterbalanced by a keen unyielding sense of justice, duty, and truth. Sir William Osler, who was never a panegyrist, characterized him, in his happy manner, as " that remarkable philospher and physician, Wells of Charleston." (Pleadwell) (4). Chaplin (3), who was not given to idle hyperbole, stated that, " altogether Wells was one of the great men of our profession during the reign of George III; a man of great scientific ability with a lofty conception of duty, and with an adherence to truth which never swerved." In 1909 Jenkins (39), discussing the pioneer work of Wells in ophthalmology, advised that " All of his writings should be collected and put into book form ere time effaces his name, lest America lose the honor of his genius, and as a precedent, to encourage future intellects." Were Wells alive today, he would be gratified to learn that the present system of electing fellows to the Royal College of Physicians is based on principles for which he struggled unselfishly; he would be happy to know that his name had been preserved by an Osler and a Chaplin; but he would still insist on the simple modest epitaph he wished for himself when on his deathbed, namely, that " he had tried to extend the boundaries of knowledge."

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GUILLAUME RONDELET

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Hospes quid sim vides. Quid
Fuerim nosti. Quid futurus
Ipse sis cogita. . . .

Most modern biologists know Guillaume Rondelet only as the author of " De Piscibus marinis," one of the earliest ichthyological monographs. But the man is obscure, and his work is considered rather a fortuitous presage of what is to follow than as an accurate barometer of the climate of opinion of his time.

Fortunately, his contemporaries and his immediate successors have been prolific in their records, and they are as candid as they are generous. From their writings it is a simple matter to reconstruct the backgrounds for the production of a work which has recently been considered only as a starting-point for what succeeds it.

I. His Life[2]

Guillaume Rondelet, one of eight children of a dealer in aromatics, was born on September 25, 1507, in the venerable town of Montpellier. Guillaume's father died shortly after the birth of this son, leaving him as legacy the advice that he ought to enter the clergy.

Guillaume was an invalid during his childhood, apparently having contracted syphilis from the only wet-nurse available at the time of his birth; he thought himself to have suffered all the diseases to which humans are subject with the exception of leprosy. In spite of his early weakness, however, his health gradually improved, and eventually he became portly; he was somewhat of a gourmand, though he is said to have abstained from wine after the age of 25.

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[2] The facts of Rondelet's life are taken principally from the biography by Laurent Joubert, a student of Rondelet's, a member of his household for several years, and his successor as Chancellor of Montpellier.

Because of his illness he secured little education from childhood instruction; and his financial resources were scant because his father, expecting him to enter the church, left him little money. His affectionate elder brother Albert, however, made up his financial deficiencies, and enabled him to pursue his desired studies. These proved to be medical, rather than theological as his father had wished, but he retained a lifelong interest in theology. Albert, by the way, was only the first of a long series of individuals to give financial aid to Rondelet, who must have had singular charm to ingratiate himself so dearly to his benefactors.

Rondelet went to Paris at the age of eighteen, and made up for his deficient early training in the space of four years. When he finally attained good health he must have been a tireless worker, sleeping little and reading and studying throughout the night. At the end of his four years in Paris, he returned to Montpellier and registered in the Faculty of Medicine in the University of that town, the most celebrated medical school of the day. He then practiced medicine for a few years, attaining little in the form of remuneration or of reputation. During these years, however, he showed the first spark of the initiative which was later to signalize him as an independent and progressive thinker. He returned to Paris to learn Greek, a study which he deemed indispensible to a contemporary physician.

During his stay in Paris he lived with Johann Günther of Andernach, who imparted to him an active interest in anatomy. Günther must have had exceptional power to inspire his students: the torch of his influence lights our knowledge not only through the works of Rondelet but also through those of his more renowned students, Servetus and Vesalius. Günther, besides being a capable teacher of anatomy, was a highly learned Humanist. He wrote an important translation and commentary of Galen, and in addition accomplished the authoritative translations of some of the important works in medicine which are obscured to us by the darkness with which we surround the Middle Ages: those of Caelius Aurelianus and Paulus Aegineta.[8] Rondelet's exhaustive knowledge of classical and me-

[8] Caelius Aurelianus flourished in Rome during the 5th century, and has been called the greatest Roman physician after Celsus. Caulus Aegineta was a 7th

diaeval medicine was doubtlessly an outcome of his contact with Günther.

Finally, in 1537, Rondelet received "a ring, a wreath of laurel and ivy, a book first closed and then opened, the kiss of peace" and the rank of Doctor of Medicine at Montpellier. In the same year a Montpellier degree in medicine was granted to a contemporary of Rondelet more familiar to us, François Rabelais. The names of Rabelais and Rondelet are often found together on a single page of the Montpellier records, and the year that these two spent together at Montpellier (1530-31)[4] cemented a friendship which probably exerted considerable influence on both.

The year after he received his doctor's degree his brother Albert, with whom he had made his home, died. Accordingly, Guillaume improved his penurious condition by marrying a lady whose sister took him and his wife, along with their servants, into her own household for four years (1538-41). At the end of this period, dissatisfied with the scanty remuneration he was receiving in his medical practice, he decided to journey to Venice to call upon his friend Guillaume Pellicier, Bishop of Montpellier, who was at that time acting in the capacity of Ambassador to Venice for Francis I of France. According to Joubert, Rondelet's sister-in-law prevented him from leaving on this journey when he was about to start: but de Bargeo, in Venice at the time, reports that Rondelet and Pellicier worked together on the history of fishes sometime during the years 1540-42.[5] In any case, Rondelet's sister-in-law, now widowed and childless and a woman of considerable financial resources, gave Rondelet half her means, promising him the rest as a legacy, on the condition that he remain in Montpellier. Shortly after this good

century Alexandrian; he remained in Egypt after the Arabian occupation and greatly influenced Moslem medicine. He has another significance for the history of medicine: one of his works, dealing with diseases *a capite ad calcem*, was translated directly from Greek to Latin, without ever having passed through the Arabic, in Salerno as early as the 8th or 9th century. The fact that such Greek works were never lost in Sicily was probably an important element in the early foundation of the medical school of Salerno.

[4] Two years previously, in 1529, a Montpellier degree of Doctor of Medicine was bestowed upon Nostradamus, by means of whose magical symbols Goethe's Faust evoked the Erdgeist.

[5] The statement from de Bargeo's letter is quoted below, p. 829 and footnote 16.

fortune, in 1545, he was appointed Regius Professor of Medicine at Montpellier by Schyron, the Chancellor of the University, and patron of Rabelais; Schyron knew this scholar through Julius Caesar Scaliger, himself a great Humanist and father of an even greater one.

Schyron performed another favor for Rondelet by recommending him as personal physician to Cardinal de Tournon, a distinguished clergyman who was a counselor of Francis I and patron of another great ichthyologist, Pierre Belon. Rondelet received 600 livres yearly for sixth months' attendance on this important person, and in addition had the privilege of making extensive journeys with him. In 1551 the Cardinal suffered an attack of dysentery, and was so delighted with the successful result of Rondelet's treatment that he gave him a pension of 200 livres for the rest of his life.

In 1549 Rondelet spent three months in Rome with the Cardinal, who undertook the journey to participate in the election of Julius III as Pope. On this trip to Rome Rondelet met Belon, and possibly also Salviani, another great contemporary ichthyologist who lived in Rome at the time. During this visit he also made the acquaintance of Aldrovandi, and it has been suggested that Rondelet, fifteen years Aldrovandi's senior, may have inspired the latter naturalist with an interest in fishes.

One may hazard the guess that during this visit Rondelet renewed his friendship with Rabelais, who was in Rome at the time as physician to Cardinal du Bellay, a member of the family that provided Francis I with so many wise counselors. The occasion of this personage's presence at Rome was the celebration of the festivities of the birth of Louis, Duke of Orleans, son of Henri II and Catherine de' Medici. Possibly, however, the hypothetical meeting of Rondelet and Rabelais was clandestine; in 1537 Cardinal de Tournon had come upon an indiscreet letter written by Rabelais to an ill-favoured Italian, an event concerning which de Tournon wrote, " If he had not used my name in the letter—and also if he had not acknowledged himself to the King and Queen of Navarre,—I should have thrown him into prison as an example to all talebearers." [6]

[6] " Si il n'eust parlé de moi en ladite lettre, et aussi qu'il s'a(dvou)e du roy et

On the return voyage from Rome Rondelet took the opportunity to visit Venice, Pisa, Bologna, Ferrara and Padua; at other times he had visited Antwerp, Bordeaux and Bayonne through the grace of the Cardinal. These voyages were an invaluable aid to him in the collection and study of fishes.

In 1556, Schyron inadvertently performed his last favor for Rondelet. He died, and Rondelet was elected his successor as Chancellor of Montpellier. Rondelet held this position for ten years until 1566, when he died.

II. His Personality

The bare outlines of his existence have been sketched; there remains the still more interesting analysis of his personality.

It has been suggested that he was progressive in thought, insofar as he was ready and eager to accept the new principles of Humanism. Humanism and the Reformation were simultaneous adventures in Southern France, and a participant in one was necessarily affected by the other. Rondelet proved to be progressive, if cautious, in the matters of the soul as well as those of the mind.

He must have been educated rigorously into the Catholic faith. Rondelet père, whose uncle was Prevost of the Chapitre Régulier of Maguelonne, had destined Guillaume for the clergy; his uncle promised him riches, should he enter the monastic life, and a chapel of his own. Though Rondelet refused these offers, he remained always an assiduous student of theology.

He did not remain a staunch Catholic, however. The exact time at which his doubts began to waver is not evident. In 1552 he burned his theological books when his friend Pellicier, Bishop of Montpellier, was incarcerated for entertaining heretical notions (and possibly dangerous company; according to Zeller he was accused also of questionable moral relationships). At this time Rondelet was hiding in his house an esteemed theologian, Caperon, who had escaped from a Dominican monastery.

A decade later, when the Protestants were gaining the ascendency

royne de Navarre, je l'eusse fait mectre en prison pour donner exemple à tous ces escripseurs de nouvelles." Lefranc, vol. 5, p. xix.

in Southern France, Rondelet was frankly among their number. In 1561, during a violent uprising, the Huguenots pillaged and took possession of some of the Cathedrals in the environs of Montpellier. When, frightened by a royal edict, the victors abandoned their newly gained citadels, Rondelet was one of a board of six appointed to enlist canons to preach in the cathedrals. In addition, a letter written from Lyon in December 1563, by a M. Viret, congratulates the Église P. Reformée of Montpellier on having certain doctors, including Rondelet, among its numbers. And Rondelet died as a member of the Protestant faith: Claude Formius, his kinsman and a clergyman, has given us an account of Rondelet's fatal illness and death considerably more detailed and comprehensive than any notice we have of his life; and in this he mentions neither confession nor extreme unction.

Thus in his spiritual as well as his intellectual beliefs he was liberal. This may have been due partly to the fact that he was a genial personage, and therefore enjoyed being an agreeable member of society. His biographers frequently mention him as a lively and witty speaker: "hilaritatis & facetiarum cupidissimus." He liked to illustrate his lectures with stories, and his courses were eagerly attended. Felix Platter, one of his distinguished students, wrote in his diary: "I heard a lecture by Rondelet today; I always enjoy hearing him speak." He experimented in architecture, and agriculture was one of the pleasures of his later days. He was fond of music: he played a viola strung with horse-hair in his early impoverished days in Paris, and later in life many other instruments; Platter taught his daughter to play the lute. He was generous to excess: his fees, as we have enumerated them, were large, yet he left his children penniless.

De Thou is responsible for the notion that Rabelais' Rondibilis, the physician who gives Panurge advice on marriage, is modeled after Rondelet. This is doubtless the case. The phonetic similarity in name, and the applicability of the epithet "Rondibilis" to a man rotund in stature lend credence to de Thou's thesis. Rabelais writes of Rondibilis "He is married and has been unmarried"; Rondelet was married at the time the book was written. Rondibilis, as well as Rondelet, likes to illustrate his doctrines with a tale. Rondelet

was proficient in Materia Medica: Rondibilis gives Panurge bountiful pharmaceutical advice concerning anaphrodisiacs.[7] And Rondibilis is eager for money! Rabelais ends his account of him with the conversation:

> Rondibilis: "I am always at your command."—"So long as I pay you," said Panurge.—"That goes without saying," replied Rondibilis.[8]

Rondelet's work on fishes is a very scholarly treatise. What interests us here that among the figures and texts describing aquatic organisms in the most recondite fashion, there stand several pages dedicated to the portrayal and description of creatures that live only in the mind, and in no other aqueous environment: a fish with the appearance of a monk; a fish with the appearance of a bishop; a leonine monster, scales covering its lion-shaped body, provided with the face of a man. Many have taken these pages as evidence that even such scholars as Rondelet gave credence to the supernatural and were unable to shake off the superstitions of the Middle Ages. In view of Rondelet's reputation for ready wit and facile imagination it would seem that when he inserted these pages the author held his tongue in his cheek. Very likely Rondelet's shade derives considerable amusement from the fact that twentieth century biologists are too devoid of humour to consider his portrayal in the spirit in which it was perpetrated!

III. His Achievements

Rondelet's professional attainments in medicine, insofar as position and remuneration are concerned, have been enumerated. What were his intellectual achievements in this branch of learning?

His published works in medicine[9] were concerned principally

[7] Rabelais is probably here satirizing the great preponderance of information concerning aphrodisiacs and anaphrodisiacs in contemporary Materia Medica; the profusion of such information was an expression of Moslem influence, and based on the fact that the Eastern temperament demanded it eagerly.

[8] This might be taken as a new example of Salernitan influence on Montpellier: one of the old Salerno teachings is "Dum dolet, accipe."

[9] A list of Rondelet's publications is appended on p. 831 below. I am very grateful to Dr. George M. Smith of Yale University for his generosity in allowing me to use his copy of the "De piscibus marinis."

with therapeutics and materia medica. He published tracts "De urinis" and "De morbo gallico" as did so many of his contemporaries, and various other works on diagnosis.

In addition, he produced several pharmaceutical works, in which he proved himself to be well-acquainted with the ancients. His illustrious contemporary Gesner, also an ichthyologist and a student of Rondelet's, wrote in a letter to Jean Bauhin: "I shall use Rondelet's statements about Dioscorides . . . I tell you frankly that I have found in them much that is useful, much that is pleasing, and many things that I did not know before."[10] Another of his well-known contemporaries, Valerius Cordus, teacher of Belon, visited him at Montpellier. Platter wrote in his diary: "On the fourteenth of July (1556) the two doctors from Brussels, Valerius and Bartholomaeus, went away; Theodore Borckmann and I accompanied them as far as Chambry. There we spent all night copying a book, 'De componendis medicamenta,' which Rondelet finally gave them." In addition, Rondelet contributed a large collection of medicinal plants to Montpellier.

The precise advances that he made in the field of pharmacology are difficult to evaluate. An "Emplastrum de Ranis Vigonis, ex correctione Rondeletii" contains the following ingredients: oil of camomile, anise, spike of lily, pig's fat, calves' fat, euphorbia of Thuris, oil of laurel, viper's fat, five living frogs, earthworms washed in wine, sap of elder-root, Campanian alloy, schoenum, lavender, matricaria, and a generous supply of wine. In view of this formula, the significance of Rondelet's proficiency in pharmacology is dubious, to say the least.

On the other hand, his relations to the progress of the study of anatomy may be more clearly analysed. He had been interested in anatomy since his early days in Paris with Günther. He was an ardent advocate of frequent dissections, to such an extent that various unsavoury rumours arose during his lifetime concerning him. He is said to have dissected one of his own children who died shortly after birth; and his student Posthius records that he begged his

[10] "Rondeletii in Discoridem (sic) dictata, inquit Gesnerus, servabo, donec ea quoque repetas. Multa in his utilia, jucunda & antea mihi incognita deprehensisse me, ingenue tibi fateor." TOURNEFORT, vol. 1, p. 31.

colleague Fontanus, who was critically ill, that he might dissect him after his death.

Leaving aside such trivial tales, it is certain that Rondelet was a progressive anatomist. The number of dissections and grave-robbings performed at Montpellier under his tutelage and that of Saporta, as described by Platter in his diary, is amazing in view of the fact that Rondelet was a contemporary of Vesalius who bemoaned so bitterly the lack of interest in dissection. He did his dissections with his own hands, and gave a course in anatomy to the barber-anatomists. At his solicitation an anatomical amphitheatre, the first to be erected in France, was built by King Henri II at Montpellier in 1556.

There are few available records concerning the exact nature of his knowledge and teachings in anatomy. Haller quotes Rondelet's student Posthius as having seen Rondelet demonstrate the ileocaecal valve; the first description of this structure is usually accredited to Caspar Bauhin, younger brother of the Jean Bauhin who was a student of Rondelet's. According to Eloy, Goelicke claimed that Rondelet was the first to describe the seminal vesicles in man; he may have been the first Renaissance anatomist to do so, but these organs were known to the classical anatomists. Riolan states that Rondelet described the ligamentous pulley of the eye before Fallopius had published anything concerning the structure. More than this concerning Rondelet's anatomical knowledge we do not know.

The reason for our dearth of information concerning his anatomical teachings is a simple one: his writings on anatomy have never been published. His few published medical works were mostly small papers, published posthumously by his friends and students to whom he had probably given them for gifts. But when he died, he left the bulk of his medical writings to Joubert for editing and publication; these works, which never have been printed, included an anatomy, a surgery, monographs on special types of disease, and much else.[11] Joubert writes that these works surpassed in amount anything that had previously been written by one man, and that no publisher in Europe would undertake the expense of publishing

[11] The titles of these works, as enumerated by Joubert, are listed on p. 832 below.

them. These are the works which Rondelet himself considered his most important medical contributions, and we are in total ignorance of their contents.

If Rondelet's actual influence on the history of medicine was slight due to the accident of his writings having remained unpublished, it bore some fruit in the works of his students. Numbered among them were Daléchamps, Lobel, and Clusius, who was his amanuensis; Gesner, Joubert, Felix Platter and Jean Bauhin, all distinguished in their own right. Platter and Bauhin were to carry his influence to Basle, already renowned because of Erasmus' connection with it; its medical faculty received from Rondelet's students sufficient fresh impetus to gain distinction among the Renaissance university faculties.

Medicine was Rondelet's profession; ichthyology one of his diversions. When he was very young, his family had a farm which was a stopping-place for the fish-carts on their way from the Mediterranean to Montpellier, and his interest in fishes is said to have been awakened at this time.

He had ample opportunity to study fishes throughout his life: Montpellier is only seven miles from the Mediterranean, and Rondelet made frequent and long journeys with Cardinal de Tournon which afforded him many chances to collect material. The information which he stored concerning fishes and other aquatic organisms during many years was compended in his "De Piscibus marinis," and in a companion volume "De rerum aquatilium." These were published at Lyons in Latin in 1554 and 1555 respectively, and in French in 1558, translated by his student and successor at Montpellier, Joubert. These volumes contain careful figures of fishes, crustacea and molluscs; the text includes descriptions of the animals and also of their internal organs. Rondelet has made copious reference to the ancient authors; he was even acquainted with a treatise on fishes by Theophrastus which is not at present available to ichthyologists. The first part of the "De Piscibus" is in itself a treatise on the anatomy and habits of fishes.

A lesser known adaptation of this work of Rondelet appeared simultaneously with the French translation: F. Boussuet's "De natura aquatilium carmen." This is a very amusing volume which

contains all the figures which illustrate the larger compendium, while in place of the scholarly text there is substituted a brief frivolous poem which tells nothing whatsoever about the organisms. In the original "De Piscibus," for instance, there is a figure showing the egg-cases and also immature eggs of the Rays. Rondelet's text gives considerable information concerning the nature of the eggs and their maturation. Boussuet merely has the following poem:

"Let those who ne'er have seen the eggs of Rays
To this our picture turn their eyes' sharp gaze;
For Mother Nature always like to show
The way in which she makes the young Rays grow." [12]

Hardly a scholarly rendition, yet probably pleasing to the jovial Rondelet!

Some of his seventeenth-century biographers have taken considerable pains to minimize the significance of Rondelet's ichthyological contributions; two of them, de Thou and Sainte-Marthe, claimed that he deserved only slight credit for his work on fishes, since the work was actually done by Pellicier, Bishop of Montpellier. Since Pellicier was himself a renowned Humanist, the story is worthy of investigation.

The accusation of actual plagiary is unwarranted and exaggerated. It is certain that Rondelet collected many of his own fishes; part of his collection of specimens was seen at the Jardin Royal de Médecine by Strobelberger sixty years after Rondelet's death, a tribute to his methods of preservation. The book was published during Pellicier's lifetime, and bore an acknowledgement to him. Rondelet's preface to the reader states: "I have had as authority, counsellor and teacher, first and foremost, Guillaume Pellicier, Bishop of Montpellier, who is distinguished by his knowledge of glorious and beautiful things; not only of fishes, but also of roots, and of plants, and of many other things." [13]

[12] "Si quis Raiarum nusquam conspexerit ova,
Dirigat huc oculorum ille suorum aciem,
Nam foecunda parens Raiis Natura creandis
Ostentavit opes loeta subinde suas."
BOUSSUET, p. 140.

[13] "Primum omnium Gulielmum Pelicerium Monspeliensem Episcopum in hon-

Pellicier undoubtedly gave much assistance to Rondelet. He was one of the most renowned scholars of his day. Joseph Scaliger, a Humanist qualified to judge, said: "Guillaume Pellicier, Bishop of Maguelonne, has more skill in Latin than any man in all France, and he easily surpasses all the ancient Romans in his knowledge of it." [14] He has already figured in our pages as Ambassador to Venice for Francis I, and even during his busy days in Venice he applied himself to science. Pietro Aretino wrote to him in 1542: "It is impossible to understand how you can be so absorbed in important affairs without neglecting your scholarly pursuits. I wonder whether it is to diplomacy or to science that you consecrate each hour of the day. It is a strange and marvellous phenomenon to see you providing His Majesty at the same time with books and with soldiers, procuring for him at once Greek manuscripts and Italian captains." [15] It is an interesting sidelight that while he was in Venice, Pellicier had many dealings with Paul Manutius, the son of the illustrious Aldus, from whose presses came so many important editions of the classical works in science and in letters.

Few of Pellicier's works are still extant: he wrote a scholarly commentary on Pliny some of which is available in manuscript form. Tournefort, who has seen this manuscript, states that it bears no similarity to the works of Rondelet. Many of Pellicier's works are lost, however, and possibly among these were to be found the writings on which de Thou and Sainte-Marthe based their accusations. It is certain that Pellicier wrote a history of fishes. Pierre Angelio de Bargeo who was in Venice with Pellicier wrote:

estissimarum et pulcherrimarum rerum cognitione praecelentem, non solum piscium, sed etiam stirpium plantarumque ac multarum aliarum rerum historiae cognoscendae suasorem, autorem atque praeceptorem habui."

[14] "Guillelmus Pelisserius, episcopum Magalonensis, vir totius Galliae linguae Latinae usque adea peritus, ut veteres omnes Romanos facile superavit in exacta illius cognitione." TAUSSERAT-RADEL, p. xxii.

[15] "Il est impossible de comprendre comment vous pouvez vous absorber ainsi dans la pratique des grandes affaires, sans cesser de poursuivre vos savantes études. Je me demande si c'est à la diplomatie ou à la science que vous consacrez chaque heure de la journée. C'est un phénomène étrange et marveilleux de vous voir, en un même temps, fournir à Sa Majesté des livres et des soldats, lui procurer des manuscrits grecs et des capitaines italiens." ZELLER, p. 353. Zeller also gives the letter in the original Italian in a footnote.

"I helped Pellicier himself when he was busy writing a history of fishes"; in the next sentence he adds that Rondelet was in Venice working with the Bishop at night.[16]

Since there is much evidence that Rondelet did a great deal of his work independently, and no actual evidence that he plagiarized from Pellicier, it seems logical to ascribe to Pellicier the rôle of adviser and collaborator. The execution of the work by which we know him was largely Rondelet's own.

IV. His Historical Significance

Rondelet's work on fishes was one of the first great monographic works of modern biology. The casual student of the history of biology sees in its pages figures of specimens collected from many regions, and suspects that Rondelet was influenced by the geographical explorations of the sixteenth century; or he sees references to Aristotle and Pliny, and remembers that the classics had only lately returned to Europe from Arabia. It is true that the changing thought of contemporary Europe stimulated Rondelet to produce his treatise. It affected him, however, only indirectly; it awakened his thoughts through the influence of his professional acquaintances. Had Rondelet led a secluded monastic life his accomplishments in the realm of Science would have been far less significant than they proved to be under the actual circumstances of his life.

In the first place, the work is not at all the product of a genius' intellect. Rondelet was a prominent physician, a progressive thinker, and a teacher influential in his day; but much of his success was due simply to good fortune and to his genial traits of character. He helped to liberalize Medicine at Montpellier, but not so much more than did his fellow-workers there, and less than his fellow-students Servetus and Vesalius. He became a Protestant during the Reformation, but as a follower rather than a leader. Had he never pub-

[16] "Ac Pellicerium ipsum in Piscium historis conscribenda occupatum mirabiliter adjuvit. Quae quidem lucubrationes a Gulielmo cum postea Rondeletio, et linguarum et rerum scientia perillustri Medico, donatae essent, magno illi usui fuerunt ad libros absolvendos, quos ipse de Piscibus perfectissimos, ac doctissimos in lucem edidit." Zeller, p. 96.

lished the treatise on fishes, we should never know his name unless we delved into Montpellier archives.

True, throughout the pages of his existence are sprinkled the names of kings and queens, of cardinals and bishops and ambassadors, of famous Humanists and satiricists and physicians. In the sixteenth century, however, such contacts might easily be attained by any pleasant person. Several economic factors fostered this condition: in the first place, even the most ancient towns were not very old as economic entities and their well-being was still dependent on the success of the merchants; the good repute of the ordinary merchant was a device which effectively levelled off the peaks of social and intellectual snobbishness. In addition, it was the custom of the day for scholars and men of letters who were without independent income to be subsidized by patrons of their choosing. A ready wit and a facile tongue were sufficient to enable a physicial to become intimately acquainted with many illustrious friends of his patron. This was especially true in the south of France in Rondelet's day: the court of Francis I was democratic because of the monarch's own nature, and his sister Margaret of Navarre was surrounded by a court made up of men who needed only to be brilliant to enter. Thus Rondelet's prominence among his contemporaries may have been based simply on the fact that he was a learned man who could ingratiate himself by the force of his jovial personality.

Rondelet's favour among his contemporaries was fostered principally by his geniality. His success in his profession remains dubious because his works are hidden. The only monuments of his life which remain are the records of his diversion in ichthyology. One of his contemporaries speaks for him in the words of an epitaph:

> Au monde ie prenois grand plaisir de cognoistre
> L'affection d'un homme ou d'un poisson de mer
> Enseigner l'Escholier rondement & l'aimer,
> Visiter le malade & sante lui promettre.
> Ores ie voy celuy qui ce tout a fait estre
> Les poissons sans poissons, les plantes sans semer,
> Qui a peu les oiseaux sans oiseaux conformer,
> Qui ce tout fait trembler a l'ombre de son sceptre.

I'ay trouue autre mer, autr'air, autres planures
Autres poissons, oiseaux & autres creatures,
De ce monde terrien plus ne suis soucieux.
Par un docte Docteur ma pratique polie
Ie vous laisse, Escholiers, monimens de ma vie
Au reste laissez moy iouir du bien des cieux.

RONDELET'S PUBLISHED MEDICAL WORKS

De materia medicinalia & compositione medicamentorum.
In *Illustrium in re medica virorum,* Batavii, 1556. (N. Y. Acad. of Med. Library.)
De materia medicinalia & compositione luculentus & brevi methodus.
Venice, 1562. (Surgeon-General's Library.)
De ponderibus, sive justa quantitate & proportione medicamentorum liber.
Batavii, 1556.
Lugduni, 1563. (Surgeon-General's Library.)
Bound with C. Clusius' *Antidotarium,* 1561. (N. Y. Acad. of Med. Library.)
Methodus curandorum omnium morborum corporis humani, in tres libros distincta. De diognoscendis morbis. De febribus. De morbo gallico. De internis & externis remediis. De pharmacopolarum officina. De fucis.
Paris, 1575. (Surgeon-General's Library.)
Lugduni, 1583.
Lugduni, 1585.
Francofurti, 1592.
Monspessuli, 1601.
Genevae, 1608.
De morbo gallico.
In a collection by the same title by A. Luisinus, Venice 1566. (N. Y. Acad. of Med. Library.)
Traité de la vérole, traduit en francais par Estienne Maniald, Bordeaux, 1576.
De fucis.
In G. Falloppii *Opuscula,* Batavii, 1566. (N. Y. Acad. of Med. Library.)
Dispensatorium, seu pharmacopolarum officina.
Coloniae, 1565. (Surgeon-General's Library.)
Formulae aliquot remediorum, libro de internis remediis omissae.
In Lobel's *Plantarum historia,* Antuerpiae, 1576. (Columbia University Library.)
In Pena & Lobel's *Nova stirpium,* 1576. (N. Y. Acad. of Med. Library.)
Consilia quaedam medica.

In a collection entitled *Consiliorum medicinalium, conscriptorum a praestantissimis medicis liber singularis,* edited by L. Scholzius.
Francofurti, 1598.
Hanoviae, 1610.

Tractatus de urinis antehac non editus.
Francofurti, 1610. (N. Y. Acad. of Med. Library, Surgeon-General's Library.)

Opera omnia medica. Nunc ab infinitis quibus antea scatebant mendis, studio et opera Joannis Croqueri, Poloni, repurgata, & in gratiam medicinae studiosorum nitori suo restituta.
Genevae, 1620. (Surgeon-General's Library.)
Genevae, 1628. (Surgeon-General's Library.)
Genevae, 1685. (Surgeon-General's Library.)
This volume contains:
Methodus curandorum omnium morborum corporis humani, in tres libros distincta.
De diognoscendis morbis.
De febribus.
De morbo Italico.
De medicamentis internis & externis.
De pharmacopolarum officina.
De fucis.
Introductio ad praxim.
De urinis.
Consilia medica.

RONDELET'S UNPUBLISHED WRITINGS

De impedimentis generationis.
De affectibus gravidae, parturientis, & puerperae.
De affectibus infantium & puerorum.
De morbis haereditariis.
Commentarii in aliquot Hippocratis aphorismos.
Commentarius in Aristotelis librum de mistione & miscibilib.
Comment. in aliquot capita lib. primi Dioscoridis.
Comment. in Galeni libros
- Artis parvae.
- De constitutione artis medicae.
- Introductorium medicinae.
- De temperamentis.
- De locis affectis.
- Quos, quando & quibus purgare oportet.
- De paratu facilib.

Anatome.
Chirurgia.
Dialectica.
Agricultura.
Commentarij in Aliquot Dauidis Psalmos.
Apologia ad Gorrhæum.
Apologia ad Cardanum.

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INDEX OF NAMES—VOLUME IV

Abbot, A. C., 638
Abel, John J., 619, 638, 645
Abendanon, Joseph, 788
Abercrombie, 432
Abercromby, 593
Abernethy, J., 799, 814
Abu Mansur Muwaffak bin Ali Al-Harawi, 94
Acland, Henry W., 477-504
Acrell, 661
Acton, 781
Actuarius, 93, 458, 462
Adam, 90, 294, 295, 714
Adamantius, 24
Adams, Francis, 203
Adams, Robert, 110, 119
Addison, Thomas, 54, 55
Aegineta, Paulus (*see* Paulus)
Aesculapius, 350, 458, 462
Aëtius, 60, 94, 458, 463
Africanus, Constantinus, 335, 336, 337
Agassiz, Louis, 626, 627
Agasthirar, 80
d'Agoty, Gautier, 288, 291
Agrippina, 426
Ahaziah, 538
d'Aigrefeuille, C., 833
d'Aix, *Sir* Jehan, 95
Albinus, 695
Albucasis, 458, 462
Alberti, Leon Battista, 29
Alcock, T., 443
Aldrovandi, 820
Aldus, 828
Alexander of Tralles, 93, 102, 117
Alexander the Great, 105
Alcott, William Andrus, 267
Al-Ghāfigī, 204
Alinari, 277
Al-Jazzār, Ibn, 335, 336
Allen, Oscar H., 631
Alling, Arthur N., 266, 268
Almenar, Joannes, 583, 584, 585, 586, 591, 599
Alrichs, 730, 731, 735, 741
Althoff, Friedrich, 9
Amzalak, Moses Bensabat, 787
Anders, 760, 761
Anderson, E. A., 266
Anderson, Sherwood, 221
Anderson, W. H., 558
Andral, G., 800, 815
André, *Major*, 122
Andreas, Petrus, 586, 587
Andrews, 781
Andrus, E. Cowles, 781
Anicia, Juliana, 261, 278
Apollo, 85, 284, 285
Apollonios of Kition, 278
Aquapendente, Hieronymus Fabricius (*see* Fabricius)
Aquilanus, Sebastianus, 583, 584, 587, 599
Aquinas, 87
de Araujo, Joaquim, 788
Archagathus, 458, 463
Archigenes, 137
Archimatheus, 795
Arcignaneus, Dominicus, 599
Arculanus, Johannes, 427
Aretaeus the Cappadocian, 89, 90, 92, 117, 137, 458, 463, 794
Aretino, Pietro, 828
Aristophanes, 426
Aristotle, 11, 24, 36, 143, 278, 283, 355, 829
Armstrong, Edward, 744
Armstrong, George, 596
Armstrong, John, 592, 596, 597
Arnott, N., 445, 448
Aschner, B., 36
Asclepiades, 458
Asdang, *Prince*, 183
Ashburn, P. M., 75
Asoka, *King*, 576
Assurbanibal, 345

Astarius, Blasius, 583, 584, 587
Astell, Mary, 367
Astruc, Jean, 583, 585, 591, 592, 593, 594, 595, 596, 597, 598
Athenaios, 137
Atlee, John L., 124, 128
Aubrey, J., 528, 535
Auenbrugger, C., 814
Auenbrugger, Leopold, 373-403, 606, 797, 814
Auerbach, 449
Augustine, 87
Augustus, *Emperor*, 29, 544
Aurelianus, Caelius, 92, 137, 818
Avenzoar, 458, 462
Averroes, 458, 462
Avestitza (*or* Samca), 346
Avicenna, 84, 426, 462, 582, 583
d'Azevedo, J. Lúcio, 785

Baalzebub, 538, 539
Bacchus, 92
Bacharach, H., 37
Bacon, Francis, 518
Bacon, Leonard, 265, 267
Baehr, George, 780
Baer, 627
Baetjer, Frederick K., 768, 781
Baglivi, 662, 667, 678, 693, 697
Bailey, Richard, 575
Baillie, M., 790, 798, 801, 804, 805, 806, 807, 811, 814
Baillou, 795, 796
Baldwin, Hugh A., 516
Baldwin, James F., 516
Balfour, *Lord*, 235
Ballonius (*see* Baillou)
Bandi, *Countess* Cornelia, 562, 566, 570
Banks, *Sir* Joseph, 243.
Baptist, St. John, 57, 60
Barbára, M., 34, 36
Bard, Samuel, 574, 575
de Bargeo, Pierre Angelio, 819, 828
Barker, Creighton, 268
Barker, George Frederic, 631, 641
Barker, Lewellys F., 114, 118, 650, 752, 769, 780
Barnes, M. E., 172, 173
Barrie, James, 235
Barrett, Joseph, 265
Bartelson, Gerrit, 723
Barth, Johann Ambrosius, 205
Bartholinus, Caspar, 46, 48, 52
Bartholinus, Thomas, 40, 41, 567
Bartholomaeus, 824
Bartlett, C. J., 266
Bartlett, Elisha, 789, 813
Barton, Benjamin Smith, 122
Barton, W. P. C., 127, 128
Baslez, Louis, 250
Bass, C. C., 76
Bass, E., 76
Bastian, 485
Batten, F. A., 769
Battie, 690
Battistini, T. S., 776
Bauer, J., 34, 35, 36
Bauhin, Caspar, 42, 825
Bauhin, Jean, 824, 825, 826
Bauhinus, Caspar (*see* Bauhin, Caspar)
Baxter, Charles, 233
Bayne-Jones, S., 268, 411
Beaman, A. Gaylord, 605
Bean, Bennet, 31, 36
Beanes, William, 123
Beaumont, William, 265, 268, 515, 600
Becker, C. H., 9
Becket, T., 118
Beekman, William, 734
Begin, M. E., 113, 119
von Belcamp, Jacob, 734
Bell, *Sir* Charles, 43
Bell, John, 43, 132
Bellamy, 703
du Bellay, *Cardinal*, 820
Bellini, 676, 693
Belloc, Hilaire, 717
Belon, Pierre, 820, 824
Benedictus, Alexander, 585, 599
Beneditti, P., 32, 36
Beneke, F. W., 29, 30, 33, 36

Benivenius, Antonius, 583, 584, 599, 797
Benivieni (*see* Benivenius, Antonius)
Berglund, H., 115, 120
Bergman, T., 104
Bergson, Henri, 15
Berkeley, *Bishop*, 266
Berkeley, 488
Bernard, Claude, 15, 21, 617, 620
Bernini, 293
Berr, Henri, 12
du Berry, Gerard, 335, 337
Berry, G. P., 780
Berthelot, P. E., 749, 750
Bertin, R. J., 800, 815
Bertipaglia, Leonard of, 257-260
Berzelius, Jöns Jakob, 349
Béthencourt, 591
Bevilaqua, Symon, 583
Bhishagratna, K., 540, 558
Bhongsri, *Queen* Soavabha, 166
Bianchini of Verona, 562
Bianconi, G. L., 261
Bichat, Xavier, 654, 758, 800, 815
Bidloo, 741
Bierring, 763
Billing, Marjery, 517
Billings, Elizabeth, 526
Billings, John, 526
Billings, John Shaw, 479, 492, 498, 760, 768, 769
Billroth, 448
Blackmore, *Sir* Richard, 100, 118
Blaikie, 488
Blake, *Sir* Henry A., 540, 558
Blankenhorn, M. A., 777
Blasius, 599
Blenkinsop, Henry, 717
Bliss, Philip, 535
Bliss, Sidney, 75
Bloch, E. Bates, 753
Blumer, George, 265, 266, 268, 752, 753
Blumer, G. Alder, 266
Boas, J., 450
Bockus, H. L., 774
Boerhaave, Hermann, 45, 109, 271, 433, 443, 456, 457, 458, 460, 574, 590, 591, 592, 596, 598, 659, 660, 661, 664, 670, 671, 674, 684, 693, 694, 695, 796, 797
Boerhaave, Kaau, 692, 695
Boggs, Thomas R., 776
Boldrini, M., 36, 37
du Bois-Reymond, Emil, 612, 614, 615, 647
Boldyreff, W., 450
Bologa, Valeriu L., 346
Bolognini, Angeli (*see* Bologninus, Angelus)
Bologninus, Angelus, 584, 585, 586, 591, 599
Bonaparte, Napoleon, 145, 151, 279, 435, 508, 611
Bonnet, Hans, 252
Borckmann, Theodore, 824
du Bordeu, 673
Borralho, José Francisco, 405
Boswell, James, 455
Bostock, 104
Botelho, Alexander, 405
Botticelli, 277
Bouchard, 32
Boucher, 277
Bouillaud, J., 799, 800, 802, 803, 804, 805, 806, 811, 814, 815
Bourbon, *Duchess of*, 81-86
Bourbon, *Duke of*, 82, 87
Boussuet, F., 826, 827, 833
Bouteille, 796
Bowditch, Henry P., 448, 619-626, 627, 628, 633, 637, 646, 648
Bowditch, Jonathan Ingersoll, 620
Boycott, A. E., 767
Boyle, Anna, 233, 241
Boyle, *Captain*, 233
Boyle, Robert, 264, 519, 521, 524, 525, 526, 535
Braccia, John (*see* John de Tracia)
Bradstreet, E. T., 267
Brahms, 221
Bragman, L. J., 117
Breasted, James Henry, 247, 248, 251, 252
Bremond, 683

Brenner, 760
Bright, Richard, 809, 816
Brillon, *Mme.*, 105
de Brito, Ana Maria, 406
Brixiensis, 596
Broca, 620
Brock, A. J., 466
Brockett, Elizabeth G., 409
Brodhead, J. R., 743, 744
Brodie, Benjamin Collins, 807
Broedel, Max, 290
Brooke, Helen C., 95, 117, 604
Brooks, John H., 767
Brown, John, 654
Brown-Sequard, 620
Browne, *Sir* Thomas, 519, 532
Brücke, 612, 614
Brugsch, 32
Brunn, W. V., 442
Brush, C. E., 759
Buckstein, J., 452
Buchner, *Doctor*, 101
Buddhadasa, *King*, 78
Bunsen, 613, 616
Burckhardt, Jakob, 292
Burdon-Sanderson, J., 647
de Burgofrance, Jacob, 584
Burnacini, 275
Burns, Alan, 798, 807, 814
Burr, H. S., 267, 268
Burrage, W. L., 553, 558, 774
Burton, 532
Burton, W., 119
Bush, F., 439, 443, 444, 445
Buswell, 763
Buxtoff, Herman, 97
Byron, 243

Cabot, 760, 768, 769
Cadogan, William, 102, 103, 104, 105, 118
Caelius, Aurelianus, 117
Caen, 562
Cagliostro, 506
Caillau, Jean-Marie, 53, 54
Calahorra, Simha, 301
Caldesi, 688
Calderwood, 488
Callistus, *Saint*, 282, 284
Cannon, Walter S., 622, 624, 648, 649
Canstatt, C., 446
Caparoni, Pietro, 511, 513
Capivacceus, Hieronymus, 432, 433
Carbone, Joh. Baptista, 786, 787
de Carbonnières, Ramond, 505-510, 605
Cardanus, 667, 795
Care, H., 96
Carlisle, Robert J., 573
Carlson, Anton J., 421, 607
Carmalt, W. H., 267
Carmalt, William H., 265
Carpenter, Abraham, 122, 124
Carr, James G., 776
Carrol, James, 762
Carroll, Harlow, 767
Carter, W. S., 173
Carvalho, Silva, 783, 784, 785, 787
Casserius, Julius, 42
Castaldi, L., 31, 37
Castel, 667, 680, 695, 697
Castiglioni, A., 553, 558
de Castro, André Lopes, 405
de Castro, José Joaquim, 405
Cataneus, 591
Cather, Willa, 222
Cavelier, William, 594
Caven, W. R., 777
Caventou, 110, 119
Celli, A., 545, 558
Celsus, 138, 144, 159-164, 261, 606, 818
Cesalpinus, 264
Cézanne, 275
Chace, A. F., 119, 120
Chaillou, A., 34, 37
Chakrabongs of Bishnulok, *Prince*, 171
Chamberlen, 717
Champlain, 718
Chamurabi (*see* Hammurapi)
Chandra, Rajaguru Sri, 77
Channing, Walter, 267
Chaplin, A., 789, 790, 813, 814

Chapman, Nathaniel, 126
Chapman, R. W., 456
Charas, 687
Charcot, 620
Charles I., 518, 519
Charles II, 126, 532, 533, 534, 594
Charles IV, 244
Charles V, 586
Charles VII, 81
Charles VIII, 87
Charles IX, 664
Chauveau, 614
Cheadle, W. B., 809, 816
Cherniss, Harold F., 139
Chertz, Michiel de Marco, 734
Chervin, 554
Cheselden, 666
Chesney, Alan M., 421, 477-504, 606, 769
Chevalier, Ulysse, 337
Chevreul, Michel-Eugène, 157
Chew, 769
Cheyne, George, 99, 100, 118
Chicoyneau, 593
Chittenden, R. H., 266
Chomel, A. F., 808, 816
Choulant, J. L., 261, 336, 814
Christ, 87, 90, 280, 577
Christian, 762, 770
Christian, Friedrich, 261
Ciocco, Antonio, 23-38
Clark, Andrew, 535
Clark, E. H., 648
Clarke, Charles C., 266
Clarke, John, 593
Claudius, *Emperor*, 426
Clay, Albert T., 266
Clement XI, *Pope*, 547
Clerf, Louis H., 514
Clermont, 697
Clews, Marie, 566
Clowes, 593
Clusius, 826
Cockburn, 593
Coga, Agnus, 527, 528
Coga, Arthur, 527
Cohn, Ferdinand, 634
Cohn, I., 76
Cohnheim, Julius, 633, 634, 635, 649
Colbert, 9
Coleman, Warren, 775
Collins, Samuel, 42, 45
Columbus, 264
Columella, 544, 547
de Commer, Jacob, 734
Confucius, 23
Congreve, 532
Conner, Lewis A., 767, 778, 781
Cook, 243
Cooper, *Sir* Astley, 439, 440, 443
Copland, John, 813, 816
Copland, William, 736, 739
Cordell, Eugene F., 558, 768
Cordus, Valerius, 824
Cornarius, Janus, 202
Cornelissen, Jan, 739
Corner, George W., 745-750
Corrigan, 797
Corvisart, 279, 375, 792, 799, 800, 806, 808, 811, 814
Corwin, E. H. L., 576
Coste, Jean-Francis, 267
Cotta, J. G., 366
Councilman, 637
Courvet, 697
Coutrie, Lysbert, 731
Cowper, 796
Coxe, John Redman, 44, 466
Coxe, Thomas, 526
Coxe, William, 509
Craig, C. F., 754
Crawford, Eliza, 550, 551, 552
Crawford, John, 145-151, 269, 549, 550, 551, 552, 554, 557, 558, 605
Crawford, *Mrs.* John, 549
Crespo, José Cardoso Rodrigues, 405
Croce, Benedetto, 7
Cromwell, 521
Croone, 526
Croone, W., 683
Crowfoot, 807
Crummer, Leroy, 335, 337, 605
Crummer, *Mrs.* Leroy, 335
Cullen, William, 109, 376, 797, 814
Culmus, 49

Cummins, Harold, 75, 76
Cupples, George, 266
Curtenye, John, 522
Cushing, Harvey, 268, 647, 648, 745, 749, 750, 754
Custini, 245

Daléchamps, 826
Dall, William Healey, 243, 244
Dante, 224
Daphne, 291
Dapper, 432
Daremberg, Ch., 474
Darwin, Charles, 553, 803
Davaine, 557
Davenport, C. B., 31, 37, 650
Davies, 456
Davis, 761
Davis, Dewey, 780
Davis, J. F., 801, 807, 815
Dawson, Warren R., 251, 252
Dedlock, *Lady*, 559, 560
Deidier, Antonius, 45
Delafield, Francis, 632, 635
Deligado, 591
Delius, 653, 658, 696
Delpeuch, A., 102, 117, 793, 794, 795, 814
Demetrius (*see* de La Mettrie)
Denis, W., 115, 120
Dennison, Joseph, 265
Derick, C., 115, 120
Dermer, *Captain*, 725
Descartes, 15, 529
Deutsch, Nicolaus Manuel, 280, 281
Deventer, 667, 741
Dhanvantari, 540
Dhu, Roderick, 554
Diana, 90
Dickens, Charles, 559, 560, 562, 569
Didier, 667
Diels, Hermann, 137, 143, 144
de Diemerbroeck, Isbrand, 48, 54
Diepgen, Paul, 252, 647
Digby, *Sir* Kenelm, 741
Diocles, 138, 139, 143
Diocletian, 285
Dioscorides, 59, 84, 261-263, 278, 511, 586, 605, 824
Dioscurides (*see* Dioscorides)
Dittrick, Howard, 514
Dock, 760
Doebner, O., 114, 119
Dohrn, Max, 115, 119, 764
Donatello, 293
Donne, John, 518
Dorat, 506
Dorsey, John Syng, 126, 435, 437, 439
Drake, Daniel, 130, 132, 136
Drake, R., 107, 118
Draper, G., 33, 34, 37
Drechsel, 633
Dreiser, Theodore, 222
Drury, A. Greer, 136
Dryander, 243
Dryden, 518, 532
Dubnow, S., 300
Ducange, 59
Dürer, Albrecht, 29, 282, 283
Dumas, Charles-Louis, 49
Dumas, Mathieu, 507
Duncan, Andrew, 107, 108, 118
Dundas, David, 802, 803, 805, 815
Dunn, F. S., 421
Dupont, Jonas, 567, 569
Dupuytren, 434, 443, 445
Duval, Carles W., 76
Duverney, Joseph-Guichard, 43, 666, 667

Ebaugh, Franklin G., 409
Ebbeil, B., 253
Ebeling, 125
Eberle, E. G., 136
Eberle, John, 121-136
Eberle, Richard, 134
Edelstein, Ludwig, 261-263, 351, 514, 605, 700
Edward VII, 478
Edwards, Jonathan, 649
Ehrlich, Paul, 633, 634, 751
Eicholtz, Jacob, 130, 136
Eilers, Wilh., 346
Einhorn, M., 451, 453
Einstein, 235
Eliot, 518
Eliot, Charles W., 622, 623, 628

Eliot, Jared, 267
Elizabeth, *Queen*, 209, 605
Eller, 698
Elliot, George A., 736
Elliot, Jabez H., 570
Elliotson, John, 600-603, 791
Ellis, A. G., 165-198
Ellis, Franklin, 136
Ellmaker, Nathaniel, 122
Eloy, N. F., 825, 833
Elsberg, Charles A., 248
Elsholtius, John Sigismund, 29, 37
Emerson, L. E., 778
Emmerson, Charles P., 774
Empedocles, 27
Engelbach, 773
Erasistratus, 138, 143
Erasmus, 826
Erfurt, M. S., 276
Erickson, 774
von Erlach, Fischer, 275
Erlanger, J., 761, 773
Ernst, H. C., 624
Erving, W. H., 268
d'Esaguy, Augusto, 404-408, 783-788
Esmein, Ch., 766
van Essendelft, Jan Pietersen, 723
Essex, *Earl of*, 518
d'Estampes, 711
d'Este, Beatrice, 221
Eucken, Rudolf, 355
Euclid, 486, 488
Eustachius, Bartholomaeus, 39, 55, 547
Evans, D., 439, 440, 444, 445
Evans, J. S., 774
Evans, Samuel, 136
Eve, 90, 294, 795, 714
Evers, Hans Heinz, 559
Ewald, C. A., 449, 450
Ewing, James, 755
Eyster, J. A. E., 774

Faber, Knud, 647
Fabricius, 264, 428, 432, 433, 663
Fabyan, Marsall, 762
Falk, I. S., 607
Falkenstein, Adam, 343
Falloppius, 598, 825, 831
Faust, 224
Faust, E. C., 76
Feigenbaum, J., 34, 37
Felix, 686
Fénelon, *Archbishop*, 367
Ferdinand IV., 244
Ferdinand of Spain, 276, 278
Fernel, Jean, 598, 795
Fernow, Berthold, 734, 743, 744
Ferreira, Costa, 787
Ferriar, *Doctor*, 805
Ferris, Benjamin, 736
Ferris, H. B., 267
Ferris, H. W., 265
Fichte, 611
Fici, V., 36, 37
Fick, L., 611
Field, Marshall, 409
Filson, John, 130
Fine, M. S., 120
Finlay, 537
Finney, J. M. T., 771
Fisher, 448
Fitz, Heber, 768
Fitz, R., 103, 118
Flandin, Charles, 156
Flechsig, 633
Fleetwood, *Divine*, 367
Fleiner, 448
Flemming, 670
Fletcher, Robert, 761
Fleuri, 698
Flexner, Simon, 634, 638, 642, 649, 650, 752, 765
Flinn, 774
Flügge, 637
Foakes, J. W., 110, 111, 119
Foderé, 562
Foerster, R., 24
Foesius, Anutius, 652
Folin, Otto, 75, 115, 120
Fontaine, 773
Fontana, Benedictus, 159
Fontanus, 825
Fontanus, Johannes, 595
Fontenelle, 458, 459, 460

Forbes, John, 373-403, 606, 812, 814, 816
Forbes, M., 104, 118
Formius, Claude, 822, 833
Fossier, *Doctor*, 76
Foster, Michael, 485, 520, 535
de Fourcroy, Antoine-François, 157
Fournier, René, 254
Fox, D. R., 609, 623, 630, 646
Fracastorius, 268, 546, 598
Fragonard, 277
Francis I, 819, 820, 828, 830
Francis, Edward, 781
Franklin, Alfred Louis August, 717
Franklin, Benjamin, 89, 105, 106, 118
Franklin, Fabian, 478
Franklin, K. J., 520, 529, 535
Fraser, 488
Frederick II, 419
Fredrich, Carl, 143
Freeman, Allen W., 65-74, 421, 606
Freeman, W., 31, 36, 37
Freinds, 462
Fried, Hiram, 776
Friedenwald, Julius, 425-454, 767, 768, 771
Friedlander, 774
Frobenius, 636
Froriep, R., 808, 815
Fuchs, Remaclus, 96, 591
Fuchs, Robert, 137, 138, 139, 140, 141, 142, 143, 144
Fulton, John F., 264, 267, 268, 269, 531, 535, 652, 653
Fürst, Julius, 788
Futcher, Palmer Howard, 536-558
Futcher, T. B., 754

Gaber, Jean Baptiste, 154, 156
Gairdner, William, 110, 114, 119
Gale, Benjamin, 267
Galen, 26, 27, 37, 60, 87, 89, 91, 92, 117, 140, 202, 207, 257, 264, 355, 466-476, 606, 610, 651, 652, 664, 667, 794, 818
Galileo, 10, 296
Gall, F. J., 25
Galvani, 10
Gammel, John, 777
Gardiner, 256
Garengot, 661, 664
Garrison, Fielding H., 75, 119, 136, 444, 445, 542, 545, 547, 558, 605, 647, 648, 649, 833
Garrod, *Sir* Alfred Baring, 89, 91, 110, 111, 114, 119
Gaster, Moses, 787
Gatch, W. D., 764
Gates, Jacob, 800, 814
Gattinaria, Marcus, 583, 587, 599
Gayley, James F., 136
Geiger, 110, 119
George III, 813
George, *Saint*, 293
Gerning, Johann Christian, 244, 246
Gerondi, Moses ben Nahman, 302
Gesner, Conrad, 61, 506, 605, 824, 826
van Geuns, M., 432
Gibbons, Phoebe, 136
Gibson, George Alexander, 768
Giesecke, M., 115, 119
Gilbert, 221
Gilinus, 591
Gilman, Daniel C., 477, 504
Gingerich, William Henry, 121
de Giovanni, A., 29, 30, 33, 37
Girardin, 507
Gliddon, G. R., 553
Glisson, Francis, 41, 652, 679, 692
Godefroi, Maximilian, 550
Godley, A. D., 558
Goelicke, 825
van Gogh, 286, 287, 289
Goldsmith, Albam, 132
Goldsmith, Oliver, 465
Goldstein, Miron, 248
Goldthwaites, 635
Goldwater, S. S., 604
Gooch, M., 31, 38
Goodnow, Frank J., 773
Goodsir, John, 51, 53
Goodyer, John, 59
Gordon, Bernard, 85

Gorgas, W. C., 547, 558
Goring, C., 26, 37
de Gorter, *Doctor*, 694
Gotch, F., 524, 535
Gould, 32
Gould, George M., 136
de Graaf, 264
de Granvil, Henri, 87
Grapow, Hermann, 249, 254, 255, 256
Graubard, Mark, 421, 607
Graves, Charles B., 266, 267
de Graville, Louis Maley, 87
Gray, Asa, 626
Greef, R., 273
Green, 128
Greensfelder, Elmer, 350
Greer, Billy, 123
Gregory, 87
Greslee, 523
Grimm, H., 29
Grisson, Louise, 707, 708, 710, 713, 714, 716
Groen, Cloes, 723
Gross, Hans, 569
Gross, M., 450
Gross, Samuel D., 129, 136
Grünpeck, 582, 591, 598
Gruner, Christian Gottfried, 597, 598
Guarini, 297
Gudger, E. W., 833
Gudzent, F., 115, 119
Günther, Johann, 818, 824
Guérin, Paul, 275
Guillemau, Jacques, 717
Gunther, Robert T., 59, 535
Guppy, *Mr.*, 560
Guttmacher, Alan F., 421, 516, 703-717
Gwynne, Nell, 533

Haden, Charles, 109, 119
de Haën, Anton, 156, 375, 653
Haeser, Heinrich, 647
Haig, A., 113, 119
Hales, *Sir* John, 523
Hales, Stephen, 156, 264
Halford, *Sir* Henry, 791
Halifax, *Marquis of*, 367
Hall, G. Stanley, 624
Hall, H. R., 256
von Haller, Albrecht, 156, 264, 271, 290, 506, 514, 610, 651-699, 825, 833
Hallock, F. K., 265, 266, 267, 268
Halsey, J. T., 76
Halsey, Robert H., 514
Halsted, William Stewart, 638
Hamberger, 684
Hamilton, W., 90, 117
Hamlet, 6
Hammurapi, 346, 418, 537
Handerson, H. E., 136
Hanley, C., 781
Hanson-Preuss, O. C., 780
Hanzlik, P. J., 116, 120
Harmanse, Martin, 723
Harris, 523
Harris, Alex, 136
Harrison, William Groce, 199
Harriss, Walter, 493, 594
Harvey, Gideon, 593
Harvey, S. C., 267, 268
Harvey, William, 10, 27, 42, 105, 295, 296, 518, 531, 545, 684
Hasse, *Monsignor*, 786
Hastings, *Professor*, 485
Hauchmann, S., 32, 33, 37
Havers, Clopton, 665
Hawes, 464
Hayden, 221
Haygarth, John, 799, 802, 810, 814, 815
Hazard, Samuel, 733, 734, 743, 744
Hazen, Allen T., 455-465
Hazen, Charles Downer, 245
Hazen, H. H., 761
Heberden, William, *the Elder*, 104, 118, 790
Hebert, 543
Hebra, 634
Hegel, 611
Heidel, Walter A., 266
Heilprinn, Joel ben Isaac (Joel Ba'al Shem I), 300

Heim, Georg, 52, 54
Heiman, J. C., 567
Heine, 222, 224
Heingarter, Conrad, 81-87
Heister, Lorenz, 431, 661
Helmholtz, 10, 612, 614, 621, 649
van Helmont, 51, 433, 741
Helmreich, 652
Hemmeter, John C., 426, 436, 451
Hendrickson, G. L., 268
Henley, Margaret, 234, 236
Henley, William Ernest, 230-241
Henri II, 820, 825
Henry *the Eighth*, 209
Henry, F. P., 743
Henry, O., 222
Henschel, A. W. E., 596
Hensel, W. U., 136
Hermes, 93
Herodotus, 137, 144, 253, 540, 543, 558
de Hery, Thierry, 712
Heubner, 632
Heucher, 595
Heuer, G. J., 771
Hewetson, John, 752
Hewlett, 763
Hewson, *Mrs.* Mary, 106
Heyde, 681
Hieron of Syracuse, 90
Highmor, 683
Highmore, Nathanael, 40, 48
Hildanus, Guilielmus Fabricius, 427
Hill, J., 102, 118
Hill, *Sir* John, 266
Hill, W., 453
Hime, H. W. L., 749
Hinojossa, 731, 743
Hippocrates, 4, 26, 27, 29, 34, 35, 37, 39, 61, 87, 89, 90, 91, 117, 138, 139, 140, 142, 143, 144, 201, 202, 203, 204, 207, 208, 212, 219, 605, 793, 794
Hirsch, 558
Hirschfeld, Ernst, 205
Hodge, Hugh Lennox, 126
Hodgen, 448
Hoff, Ebbe C., 517-535
Hoff, Phebe M., 517-535
Hoffman, 109
Holland, *Sir* Henry, 554, 558
Holland, Philemon, 539
Holloway, 694
Holmes, Oliver Wendell, 268, 622
Holt, William Stull, 145
Home, *Sir* Everard, 109
Homer, 23, 277
de Hondt, P. A., 118
Hooke, Robert, 264, 688
Hooker, S. D., 803
Hopkins, Johns, 492, 500
Horace, 544
Horder, T. H., 765
Horus, 1
Howard, C. P., 781
Howat, D., 34, 37
Hubbard, R. S., 116, 120
Hudson, Henry, 720
Hughes, 683
Hume, Edgar Erskine, 124, 136
Hume, Joseph, 759
Hunley, Effie Smither, 751-781
Hunt, Robert, 603
Hunter, John, 433, 434, 444, 445
Husson, *Monsieur*, 107
Hutchinson, Jonathan, 23, 37
Hutten, 586, 599
Huxley, *Professor*, 479, 481, 485

Ibn abi Usaybia, 205
Ilberg, Ioannes, 143, 278
Imbert, 667
Im-Hoff, Johannes Rodolphus, 594
Innocent III, *Pope*, 545, 578
Innocent XI, *Pope*, 547
Innocent XII, *Pope*, 547
Inocêncio, 785, 786
Ionicus, 87
Irj, 253
d'Irsay, Stephen, 651
Isaiah, 538
Isaac, Israeli, 299
Isak, Abraham, 337
Ives, Eli, 268

Jaccoud, S., 808

Jackson, Chevalier, 453
Jackson, C. L., 453
Jacobi, Mary Putnam, 796, 814
Jacobs, Henry Barton, 152, 153, 155, 800, 815
Jacoby, C., 114, 119
Jacocks, W. P., 77
Jallabert, 679
James II, 533, 534
James, *Duke of York*, 533
James, Henry, 235
James, Robert, 455-465
James, Walter Belknap, 779
James, William, 624
Jamieson, Gerald, 409
Janeke, Hanns, 720, 724, 725, 727, 728, 729
Janeway, Theodore C., 786, 776
Jansen, Kersten, 723
Jason, 528
Jaspers, 289
Jaucourt, 507
Jefferson, Thomas, 507, 514
Jenkins, E. H., 267, 268
Jenkins, N. B., 813, 816
Jenner, Edward, 800, 801
Jevons, 488
Job, 87, 280
Johannitius, 257
Johnson, 768
Johnson, Amandus, 722, 726, 729, 743
Johnson, J., 814
Johnson, Samuel, 455-465
Johnson, Thomas, 516, 717
Johnston, William B., 516
Jones, *Doctor*, 762
Jones, T. Duckett, 777
Jones, W. H. S., 204, 205, 543, 558
Jonson, Ben, 519
Joseph II, 244
Joubert, Laurent, 817, 825, 826, 833
Jürgensen, T., 448
Juettner, Otto, 121, 130, 136
Jukes, E., 439, 443, 444, 445
Julius III, *Pope*, 820
Junker, H., 253
Justi, Carl, 263
Jutte, M. E., 452
Juvenal, 544

Kalbfleisch, Karl, 138, 139
Kálidása, 541
Kalkar, 290
Kalm, Peter, 744
Kant, 11
Karina, 346
Katz, Naphtali, 299-331
Kaup, 32
Kayserling, M., 787, 788
Keen, G. B., 743
Keen, Jonas, 743, 744
Keil, Harry, 789-815
Kekule, 631
Kele, Richard, 739
Kelling, G., 453
Kelly, Augustus, 52
Kelly, Howard A., 31, 136, 159, 546, 553, 558, 638
Kenet, *Bishop*, 533
Kennedy, John, 455
Kenthaby, Alfredo Antunes, 754
Kerckringius, Theodorus, 48, 53, 55
Kerr, William J., 776
Key, Francis Scott, 123
Kierstede, Hans, 723, 724
Killan, J. A., 119
Killian, G., 453
King, Edmund, 526, 527
King, Francis T., 491
King, John T., 780
Kinglake, Robert, 104, 118
Kinsolving, Ann, 221
Kipling, 235
Kircher, Athanasius, 546, 552
Klapp, Joseph, 122, 128
Klebs, Arnold C., 15, 556, 558, 634
Kleist, 289
Knight, Jonathan, 267, 268
Knox, Henry, 103
Knox, J. H. M., 770
Koch, Robert, 11, 610, 634, 636, 637
Kock, Friedrick Hans, 727
Kögler, Ignatio, 786
Koller, Karl, 350

Kopp, Joannes Henricus, 566, 567, 568, 569
Krateuas, 262
Krauetermann, Valentino, 102
Kraus, F. R., 342
Krause, Arlington C., 250, 345
Krehl, 801
Kretschmer, E., 35, 37
Kreysig, F. J., 791, 805, 814
Kronecker, Hugo, 617, 621, 633, 647, 649
Krook, 562
Kruger, *Doctor*, 658
Krumbacher, R., 336
Krumbhaar, Edward B., 514
Kühn, 60, 466, 467, 468, 469, 470, 471, 472, 474, 475
Kühne, Willy, 620, 648, 649
Kunstmann, W. C., 343
Kussmaul, A., 445, 446, 447, 448, 449, 453

Labarter, 346
Lacroix, Paul, 717
Lactantius, 24
Laennec, R. T. H., 376, 601, 757, 773, 777, 778, 792
La Faye, 661, 662
La Guardia, *Mayor*, 604
de Laguna, Daniel Lopez, 788
Laidlaw, George F., 775
Lair, Pierre-Aimé, 562, 568, 569
Lambert, Alexander, 777
Lamberton, 729
de La Mettrie, 636, 653, 695
La Motte, 658, 665
Lamprecht, Karl, 12
La Mure, 99
Lancisi, Giovanni Maria, 546, 547, 548, 557, 796
Landis, H. R. M., 136
Landulphus, Caesar, 583, 584, 587
Lane, John E., 265, 266, 267, 268, 595
Langenbeck, C. H. M., 272, 557
Langerak, Johannes Arnold, 590
Langrish, B., 683
Lankester, 621
Lankester, Henry, 757
Largus, Scribonius, 427
Larkey, Sanford V., 61, 77, 200, 201-219, 269, 351, 421, 423, 514, 571, 605, 607, 700
Larrey, D. J., 434
Lassar, 633
Lauder-Brunton, 621
Laurens, Henry, 76
Laveran, 557
Lavater, John Casper, 23, 25, 37, 506, 516
Lawson, Herman A., 778
Laycock, Thomas, 28, 38
Lazarowitz, L., 36, 38
Lazear, Jesse William, 755, 756, 759
Leber, Ferdinand, 43
Lebrun, 507
Le Cat, 562, 567, 653, 696, 697, 698
Leche, Stella, 75
Le Clerc, Daniel, 463
Lee, Frederic S., 619, 645
Leeuwenhoek, Antonj, 663
Lefèvre, 446
Le Fevre, Jehan, 95
Lefranc, A., 821, 833
Legge, James, 38
Lehman, George F., 44
Lehmann, Hermann, 336
Leigh, R. Wood, 251
Le Low, 23
Lenormant, 538
Leonard, John, 604
Leonardo da Vinci, 29, 290
Leonhardo, Henricus F. F., 52
Leonicenus, Nicolaus, 582, 583, 584, 585, 586, 599
Leprotus, Antonius, 595
Letulle, 777
Leube, W. O., 426, 427, 448, 450
Leukart, Rudolf, 627
Leuwenhoek (*see* Leeuwenhoek, Antonj)
Levick, James L., 724
Levin, A. L., 450
Levine, S. A., 776
Lewis, Frederick T., 649
Lewis, Paul A., 765

Ley, Willey, 61
Leydig, 627
Libbey, Frederick J., 421, 607
Libman, Emanuel, 776
Lieutaud, Joseph, 43, 51, 54
Linacre, Thomas, 209
Linnaeus, 244, 461
Linné, 513
de Lint, J. G., 248, 249, 253
Lister, *Lord*, 76, 231, 232, 481
Lister, Martin, 593
Lister, William, 807, 809, 810
Liszt, 221
Little, Carl F., 774
Littré, E., 140, 142, 144, 337
Lloyd, H., 202
Lloyd, *Lord* Kenyon, 813
Lobel, 826
Locke, John, 367, 518
Lockie, L. M., 116, 120
Lodge, Thomas, 269
Lombard, Warren P., 616, 617, 619, 624, 645, 647
Lombroso, Cesare, 25, 26, 33
Long, Esmond R., 514
Longstreth, Morris, 113, 119
Lorenzini, Steph., 668
Loselius, John, 103
Louis, 609, 630
Louis XIV, 105, 533
Louis, *Duke of Orleans*, 820
Love, A. G., 31, 37, 38
Lovelace, *Colonel*, 736
Lowe, Peter, 202, 204, 205
Lowell, James Russell, 91, 105
Lower, Edward, 517
Lower, Humphrey, 517
Lower, Richard, 264, 517-535
Lower, Thomas, 517
Lucas of Leyden, 276, 279
Ludekens, David, 741
Ludwig, Carl, 485, 609-650
Ludwig, Ch. G., 375
Lugo, *Cardinal of*, 405
Luisinus, Aloysius, 582-599, 831
Lups, *Doctor*, 658, 678
Lush, 762
Lyman, D. R., 267, 268
Lyon, B. B. V., 450

Mabire, 698
Macalister, R. A. S., 538, 539, 558
MacAuliffe, L., 34, 37
MacCallum, J. B., 643, 650
MacCallum, W. G., 536, 754, 761
McClellan, George, 126, 127, 128, 129, 130
McClellan, *General* George B., 127
McClellan, *General* Samuel, 127
McClure, 770
McCollum, E. V., 607
McCoy, Raymond F., 367-372
McCrae, Thomas, 756, 763, 768, 777
Macculloch, 555
McDougle, Ivan E., 421, 607
Machado, João Lopes Cardosa, 404
MacKinney, L. C., 701
Maclagan, J. M., 109, 119
McLean, John D., 776
McLester, James S., 777
Macmichael, William, 791
Macquer, Pierre-Joseph, 154
Madonna, 284
Magendie, 17, 610, 612, 617
de Magni, 658
Magnus-Levy, A., 115, 120
Magroth, George Burgess, 569, 572
Maguelonne, *Bishop of* (*see* Pellicier Guillaume)
Mahidol of Songkla, *Prince*, 165-198
Mahidol, *Madame*, 184
Maimonides, 299, 307, 350
Major, R. H., 454
Mall, Franklin Paine, 619, 623, 630, 637, 638, 639-645, 646, 650
Malloch, Archibald, 269
Malpighi, 264, 659
Malthus, 550
Manetho, 254
Maniald, Estienne, 831
Manson, 537, 543
Mantel, Gideon, 267
Manutius, Paul, 828
Manwaring, 593
Marat, Jean Paul, 268

de Marchettis, Dominicus, 39, 48
Marduk, 364
Marey, 613
Marti, Fritz, 353-366
Martin, H. N., 485
Martin, Newell, 637
Martinet, 32
Martius, F., 34, 35, 38
Martyn, Thomas, 243-246, 605
Marxer, Anton, 764
Mary, 359
Mary, *Queen of England*, 534
Massa, Nicolaus, 586, 588, 598, 599
Massaria, Dominicus, 585, 599
Matas, Rudolf, 76
Mather, Cotton, 760
Mathew, 539
Mathews, C. B., 437
Mathey, A., 805, 815
de Matos, Ricardo Pinto, 787
Mattern, Johannes, 421
Matthioli, Petrus Andrea (*see* Mattioli, Petrus Andrea)
Mattioli, Petrus Andrea, 511, 513, 586, 599
de Mattos, *Mrs.* Katherine, 234
Mauriceau, Francois, 717
Mayer, Pieter, 734
Mayerson, H. S., 75, 76
Mayhow, John, 519, 531, 535
Mazini, 683
de Meare, Edmundus (*see* O'Meara, Edmund)
Meckel, Joannes Fridericus, 50, 51, 52, 55
Medea, 528
de'Medici, Catherine, 820
Medicus, Fritz, 353-366
Meiner, Felix, 355
Meissner, Bruno, 343, 347
Mekel, 667
a Mekren, Job, 661
Mencius, 23, 28
Mencken, Henry L., 222
Mendel, Clarence, 267
Mendel, L. B., 266
Mendes, Fernando, 404, 405, 406
Mercatus, 795
Mercurialis, Hieronymus, 426
Mère, 562
Mesmer, 602
Messeloff, C. R., 797, 806, 814
Metchnikoff, Elie, 76, 349
Meyer, K., 765
Meyerhof, Max, 248, 252
Meyers, Merrill M., 776
Meynell, *Mrs.*, 235
Meynert, Theodor, 634
Meynet, P., 809, 815
Michelangelo, 296
Miculicz, J., 453
Middleton, William S., 514
Mif'alot, Elokim, 299-331
Millar, A., 596
Miller, 768
Miller, Genevieve, 243-246, 505-510, 605
Miller, Robert T., 516
Miller, W. S., 268
Millet, 567, 568
Millington, 519, 521
Mills, E. S., 781
Milton, 518, 532
Minitii, Francisi, 202
Minor, Thomas, 268
Minot, Charles S., 619, 623, 626-630, 649
Minot, George R., 105, 777, 778
Minuet, Peter, 720
Mitchell, J. F., 756
Mitchell, Thomas D., 43, 132, 133, 136
Moffit, Herbert C., 769
Moliere, 266
Molinetti, Antonius, 41, 42, 43, 44, 48
Moll, Albert, 199
Monro, Alexander, *Jr.*, 434, 444, 445
de Montagnana, Bartholomaeus, 85
Montague, Edward Wortley, 405
Montesquieu, 53
Monthesaurus, Natalis, 583
Montpellier, *Bishop of* (*see* Pellicier Guillaume)
Moodie, Roy L., 250, 251

Moore, J. Earle, 421, 607
Morgagni, Joannes Baptista, 39, 49, 52, 373, 374, 514, 547, 595, 796, 797, 805, 810
Morgan, 773
Morgan, T. H., 644
Morin, 458
Morozzo, *Count*, 570
Morris, Roger S., 766, 767, 774
Morrison, Samuel, 425-454
Morrison, Willy, 232
Moschowitz, Eli, 231-241
Moses, 87
Mosso, 621
Moxa, 90, 98
Mozart, 221
Müller, Johannes, 612, 613, 647
Müller, Reiner, 346
Muhlenberg, Frederick, 124
Mullo-Weir, C. J., 341
Mumford, James Gregory, 136
Münchhausen, *Baron*, 9
Mundt, Heindrich, 729
Munk, 784, 785, 787
Murphy, William P., 777, 778
Murrell, William, 762
Musser, J. H., *Jr.*, 75, 76
Musser, John Herr, *Sr.*, 76
Mussey, Reuben D., 132
Mustard, H. S., 421, 606
Myers, Albert Cook, 743
Myers, V. C., 119
Myoides, 539
Myrepsus, 93

Nagarjuna, 540
Nagel, Mauritius, 52
Nahmanides (*see* Girondi, Moses ben Nahman)
Napoleon (*see* Bonaparte, Napoleon)
Navarre, *King of*, 820
Navarre, Margaret, 830
Navarre, *Queen of*, 820
Needham, Joseph, 269
Neff, Hans Heinrich, 121
Neisser, 633
Nergal, 537, 538, 539
Nesbit, 666
Nestor, 617
Netter, 773
Neuburger, Max, 137, 144, 377, 646, 794, 814
Newberry, Francis, 464, 465
Newberry, John, 465
Newton, Isaac, 519
Newton, Thomas, 202, 203, 204
Nibha, *Princess* Chandra, 178
Nicander, 426
Niceron, R. P., 834
Nicholls, Mary, 517
Nichols, 243
Nicolaï, *Doctor*, 658
Nicolaier, A., 115, 119
Nieto, David, 784, 787, 788
Nightingale, Florence, 500
Noguchi, Hideyo, 777
Noltemius, B., 375
Nonnus, 93
North, Elisha, 268
Norton, Rupert, 753, 768, 771
Nott, Josiah Clark, 552, 553, 554, 555, 556, 558
Nunberg, Herman, 489
Nurse, Timothy, 522
Nuttal, G. H. F., 558
Nuttall, 638

Oates, Titus, 533
Ochsner, Alton, 76
Odier, 811
O'Donnell, John, 549
Oeder, Cl., 680, 683, 685, 686, 688, 695
Offord, J., 558
Olhasius, Joachim, 46
Oliver, John Rathbone, 77, 145-151, 269, 514, 515, 559-572, 604, 605, 700, 701
Oliver, William, 100, 118
O'Meara, Edmund, 523, 535
Ooster, Jan, 730
Opie, E. L., 756
Oporinus, 61
Oppenheimer, Jane M., 817-834

Orfila, Matthieu-Joseph-Bonaventure, 156
Orfila, M. P., 434, 443
Oribasius, 102 426
Ortlob, Frederick, 677
Oser, L., 449
Osler, *Sir* William, 69, 75, 222, 609, 617, 623, 625, 638, 647, 648, 760, 765, 768, 770, 772, 773, 775, 777, 778, 779, 780, 781, 813, 815
Othello, 6
Ovid, 277, 528

Pacchioni, 667
Packard, F. R., 546, 558, 575, 648, 649
Pagel, J., 137, 144, 583
Paine, J. R., 452, 454
Paiva, Manuel Joaquim Henrique, 406
Palaeologus, *Emperor* Michael, 94
Palefski, I. O., 452
Palladio, Andrea, 297
Palladius, 544, 547
Palmella, *Duke of*, 785
Panofsky, 283, 291
Panurge, 822
Papegoja, Johan, 727
Paracelsus, 5, 11, 353-366
Paradise, N. B., 269
Paré, Ambroise, 89, 96, 117, 516, 546, 558, 664, 667, 703-717, 718
Parent-Duchâtelet, Alexandre-Jean-Baptiste, 156
Pareto, 23
Parey, Ambrose, (*see* Paré, Ambroise)
Parisinus, Anonymus, 137, 138, 140, 143
Parkenham, 124
Parker, *Sir* Gilbert, 235
Parrhasius, 29
Parrish, 126
Parry, *Doctor*, 800
Parsons, 683
Parsons, H. S., 151
Pascal, 508
Paschalis, Joannes, 596
Pasteur, Louis, 11, 152-157, 606, 636, 775
Paul, J. R., 267, 268
Paullin, James, 778
Paulus, 60, 93, 458, 462, 818
Pavlov, 633
Peabody, F. W., 765, 766
Pearce, Richard M., 172, 173, 174, 181, 185
Pearl, Raymond, 23, 29, 30, 31, 35, 38
Pecklin, J. N., 428
Pedro, *King*, 404
Pélicier, 87
Pelidisi, 32
Pelletier, 110, 119
Pellicier, Guillaume, 819, 821, 827, 828, 829
Pende, N., 30, 34, 35, 38
Penn, William, 121, 126
Pennell, Elizabeth Robbins, 233
Pepagomenus, Demetrius, 94, 795
Pepper, William, 105, 118
Pepys, Samuel, 226, 518, 526, 527, 535
Percival, James Gates, 265
Pericles, 29
Perkins, 516
Perret, P. M., 87
Perrier, C., 26, 38
Pertz, G. H., 59
Peter, Robert, 136
Peters, Herman, 719
Petruccius, 39, 48
Petrus, Henricus, 586, 587
von Pettenkofer, Max, 605, 636
Petterson, Alfred, 767
Phares, Simon, 87
Philip II, 23
Phillipps, *Sir* Thomas, 335
Photius, 463
Phrisius, Laurentius, 586, 599
Physick, Philip Syng, 122, 435, 437, 438, 444, 445
Piersol, George Morris, 774
Pietersen, Adriaen, 724
Pietersen, Anna, 724
Pietersen, Evert, 735

Pietersen, Jan, (*see* van Essendelft, Jan Pietersen)
Pickering, Edward, 626
Pignet, 32
Pijoan, Michael, 717
Pijoan, Sussan, 717
Pinches, T. G., 558
Pincius, Philippus, 159
Pinkerton, John, 744
Pinto, Antonio José de Sousa, 405
Pisano, Andrea, 276, 277
Pitcairn, David, 790, 798, 803, 804, 807
Pitt, Grace, 570
Pius VI, *Pope*, 244
Planchon, J. E., 102, 118
Plato, 354
Plattard, J., 834
Platter, Felix, 822, 824, 826, 834
Pleadwell, F. L., 789, 813, 814
Pleasants, Hall, 549, 558
Pliny, 60, 539, 558, 582, 595, 599, 828, 829
Ploss, 449
Plutarch, 24
Poe, Edgar, Allen, 559
Poiseuilles, 613
Poisson, F., 562
Polemon, 24
Policamus, 282
Poll, Nicolaus, 586, 587, 591, 599
Pombal, *Marquis of*, 405, 784
du Ponceau, 125
da Porta, Bonastruc, (*see* Gerondi, Moses ben Nahman)
della Porta, Giambattista, 24, 25, 37
Portal, Antoine, 43
Portland, *Duke of*, 104
de Portonariis, V., 583
Posidonius, 605
Posthius, 824, 825
Potter, 761
Potter, Francis, 528, 529
Power, *Sir* D'Arcy, 248, 535
Powers, Hiram, 130
Pozzi, Guiseppe Ippolito, 43
Prajadhipok, *King*, 183
Pratt, Joseph H., 514, 761
Prattia, (*see* de Tracia, John)
Prausnitz, G., 273
Praxagoras, 138, 139
Preuss, Julius, 299
Priderving, John, 405
Primaticcio, Francesco, 278
Pringle, *Sir* John, 154, 156
Printz, Johann, 725, 728, 742
Prinzhorn, Hans, 288, 289
Proksch, 584, 587, 592
Proust, Marcel, 420
Prudden, T. Mitchell, 631, 634, 636
de Puis, François, 703, 707, 710, 715, 716
de Puis, Marguerite, 703-717
Pupin, Michael, 365
Purkinje, Johannes Evangelista, 349, 619
Puschmann, Theodor, 92, 117
Pythagoras, 27

Quesnay, 661
Quetelet, Adolphe, 29, 32, 38
Quirinus, 282

Rabelais, François, 819, 820, 822, 823, 833, 834
Rabinowitz, M. A., 116, 120
Radbill, Samuel X., 121-136, 718-744
Radulfe, 91
Raleigh, *Sir* Walter, 99
Rama VI, *King*, 183
Ranby, John, 50
Rangonus, Thoma, 591
Rangsit, *Prince*, 178
Ranke, Hermann, 254
Ranvier, 620, 627
Rappaport, C. E., 583
van Rassenburgh, William, 730, 731
Raynalde, Thomas, 717
Raynor, Mortimer Williams, 410
Read, John, 202
Reade, Charles, 266
von Recklinghausen, 632, 635
Redi, Francesco, 546
Reed, J., 439, 440, 443, 444, 445
Reed, L. J., 31, 38

Reed, Walter, 515, 638
Rehfuss, M., 451
Reich, H., 448
Reichle, H. S., 116, 120
dos Remédios, Mendes, 784, 785, 787
Remsen, I., 485
Renault, C., 434, 443, 445
Rewidzoff, 453
Rhases, 337, 584
Rheginus, Constantinus, 336
Rhuphos of Ephesus, 794
de Ricci, Seymour, 335
Richard *the Third*, 129
Richards, 768
Richter, Paul, 160
Ricketts, H. T., 764
Riegal, F., 450
Riesman, David, 771, 774
Riley, Henry Alsop, 409
Rindfleisch, 621
Ring, John, 549
Riolan, Jean, 40, 41, 52, 666, 825
Riverius, L., 27, 28, 38
Rivers, Thomas M., 780
Roberts, Joe, 75
Robertson, J. D., 445
Robespierre, 508
Robinson, Bryan, 661
Robinson, G. Canby, 607
Robinson, Nicholas, 593, 594
Robinson, Victor, 348, 349
Roch, *Saint*, 273, 274, 275
Röntgen, 364, 365
Roessle, R., 31, 38
Rösslin, Eucharius, 717
Rogers, Leonard, 763
de Rohan, *Cardinal*, 594
de Rohan, *Monsieur*, 711
Rohde, Eleanour Sinclair, 736
Romberg, 801
Rondelet, Albert, 818
Rondelet, Guillaume, 817-834
Rondelet *père*, 817, 821
Rondibilis, 822
Roosevelt, Isaac, 575
Rose, Wickliffe, 172
Rosen, George, 600-603, 609-650
Rosenau, Milton Joseph, 767
Rosenbach, Ottomar, 448, 633
Rosenheim, T., 453
Rosenow, 769
Rosenthal, L., 448
Ross, 537, 539, 542
Ross, George T., 124
Roth, Cecil, 788
Roth, Moritz, 5
Roudin, Mata B., 231-241,
Roulet, F., 31, 38
Rousseau, Jean-Jacques, 277, 505
Rouxeau, Alfred, 773
Roverellus, 591
Rowland, *Professor*, 485
Rowley, M. W., 762
Rowntree, Leonard G., 768, 769
Rubens, 280
Ruhrah, John, 220-229
Ruisch, John, 569
Rumsey, 428
Rupp, 121
Rush, Benjamin, 122
Rutledge, B. H., 751, 780
Russell, Frederick F., 768
Ruysch, 458, 682, 741
Ryff, W. H., 427
Rynvelt, 731

Sabin, Florence R., 643, 648, 650
Sailer, Joseph, 776
Sainte-Beuve, Charles Augustin, 505, 506, 507
Sainte-Marthe, S., 827, 828, 834
Salmon, 809
Salomonsen, 633, 634
Salvenmoser, 618
Salviani, 820
Samca, (*see* Avestitza)
Sampson, *Doctor*, 266
Samuda, Isaac de Sequiera, 783-788
Sand, Maurice, 543
Sanderson, Burdon, 485
Santorinos, Joannes, 278
dos Santos, Ribiero, 786, 788
Sapir, Edward, 410
Saporta, 825

Sarmento, Jacob de Castro, 404, 405, 406, 784, 785
Sarton, George, 1, 4, 6, 252, 606, 834
de Saussure, Horace Bénédict, 505
de Sauvage, 699
de Sauvage de la Croix, F. B., 801, 808, 815
Saxl, 283
Saye, Hymen, 95, 117, 299-331
Scaliger, Joseph, 828
Scaliger, Julius Caesar, 820
Scanarolus, 583, 584, 591, 599
Schadt, George L., 604
Schäfer, E. A., 623
Scharf, John Thomas, 145
Scheele, Karl W., 104
Scheil, V., 342
Schellig, 591, 598
Schelling, 366, 611, 612
Schindler, R., 453
Schlichting, Daniel, 661, 668, 669
Schmitz, Adamus, 51
Schneider, Conrad Victor, 796
Schnitker, Maurice A., 89-120
Schnitzler, 222
Schöne, Hermann, 278
Schoenlein, 557
Schofield, Peter, 570
Schröder, H., 542, 558
Schroeder, K., 116, 120
Schubert, 221
Schultens, Albert, 458
Schultze, Ernest, 542
Schulze, Max, 621
Schwab, John Christopher, 333
Schwarz, 685
Schyron, 820, 821
Scot, John, 87
Scott, *Divine*, 367
Scott, James, 439
Scudamore, Charles, 107, 108, 118, 805, 810, 815
Scultetus, Joannes, 427
Sebastian, 282, 284, 285, 286, 287
Sebrick, Salome, 123
Securis, John, 201, 202, 206, 207, 209, 211
Sekhmet, 1
Selling, L., 764
Senac, 51, 680, 797
Sennert, Daniel, 27, 38, 96, 97, 117
Sequin, Edward C., 266
Servetus, 264, 818, 829
Seth, 87
Setschenow, 616, 647
Severinus, Marcus Aurelius, 49, 52, 678
Shaw, John Bernard, 222
Shaw, Peter
Sheldon, 526
Shem, Joel Ba'al, 299-331
Sherwen, *Doctor*, 801
Shew, Joel, 267
Shields, Roden, 232
Shoenfield, Dudley D., 409
Shotts, 232
Shropshire, 758
Shüz, 243, 505
Shumacker, Harris B., *Jr.*, 39-56
Shumacker, Myrtie L., 56
de Sienne, Aldebrandin, 313
Sigaud, 34
Sigerist, Henry E., 1-13, 57-60, 76, 77, 80, 81, 85, 152-157, 199, 200, 268, 269, 271-297, 333, 335-339, 348, 351, 373-377, 410, 411-422, 423, 511-513, 514, 516, 573-581, 604, 605-606, 607, 700, 701, 814.
Silpasatra, Phya Baisal, 173
Simon, Max, 466
Simon, Sidney, 452
Simmons, George Henry, 775
Sims, J., 791
Singer, C., 834
Sissinios, *Saint*, 346
Sloane, *Sir* Hans, 594
Smith, 148
Smith, Elihu Hubbard, 266
Smith, Erwin, 771
Smith, George M., 266, 269, 823
Smith, H. L., 764
Smith, Jesse, 132
Smith, Theobald, 76
Smithies, F., 452

Snowden, Roy R., 769
Sobierus, 428
Socrates, J. C., 431
Solingen, 741
Solis-Cohen, 762
de Solo, Gerard, 337
Solomons, Israel, 785
Somervail, 448
Soper, H. W., 452
Soranus, 137, 144, 278, 794
Sousa, João Antonio Pereira, 406
Spiegelberg, W., 250
Spigelius, Adrianus, 40
Spurzheim, J. C., 25, 38
Stack, Thomas, 594
Stahl, Georg Ernst, 652, 653, 670, 686, 691, 693, 695
Staley, Edgcumbe, 272
Staughton, *Doctor*, 133
Steber, 598
Steele, John Dutton, 763
Steele, Richard, 367, 368
Stehman, H. B., 136
Stein, Gertrude, 642, 650
Steiner, W. R., 266, 267, 268, 759
Steinschneider, M., 337
Stenius, R., 117
Stephen, Leslie, 232
Sterne, Neuton S., 776
Stetson, Richard P., 778
Stevens, George, 235
Stevenson, *Mrs.* Fanny, 234
Stevenson, Robert Louis, 232, 233, 234
Stewart, B., 488
Stewart, *Doctor*, 694
Stewart, Hugh Angus, 768
Sthael, Peter, 521, 522
Stidden, Timon, 725, 727, 728, 733, 734, 735, 736
Stiller, B., 35, 38
Störck, 797
von Stoerck, *Baron*, 101, 102, 117, 118
Stone, 768, 778
Storch, 671
Straub, H., 765
Straus, William L., *Jr.*, 200
Street, George, 235
Streeter, E. C., 266, 267, 591
Stricker, Salomon, 634
Strobelberger, 827
Strouse, S., 764
Stubbe, Henry, 519, 535
Stuyvesant, P., 732, 734, 741
Sudhoff, Karl, 5, 221, 248, 249, 252, 253, 277, 283, 364, 578, 583
Suessanus, 596
Sullivan, 221
Summerson, *Miss*, 560
Susruta, 540, 541, 542
Sussman, M., 453
Sutton, Thomas, 106, 116, 118, 120
Swammerdam, 264, 552, 675, 741
Swenson, Jacob, 736
Sweeney, H. M., 76
van Swieten, 375, 380, 388, 661, 797
Sydenham, Thomas, 89, 91, 98, 105, 110, 113, 117, 118, 122, 456, 593, 594, 796
Sylvius (de le Boë), Franciscus, 45, 741
Sylvius, Jacobus, 208
Synesios, 337

Tardieu, August-Ambroise, 156
Tausserat-Radel, A., 828, 834
Tauvry, Daniel, 46, 677
Taylor, *Divine*, 367
Teichmeyer, 49
Temkin, C. Lilian, 466-476, 606
Temkin, Owsei, 77, 137-144, 159-164, 247-256, 341-347, 466-476, 514, 515, 516, 606, 651-655, 700
Temple, *Sir* William, 97, 117
Tenison, 533
Tennison, Richard, 99
Teubner, B. G., 24
Thacher, James, 268
Thackeray, W. M., 600, 603
Thayer, Susan Read, 153
Thayer, William Sydney, 153, 751-781
Themison, 137
Theophrastus, 59
Theresa, *Saint*, 293

Thoms, Herbert T., 265, 266, 267, 268, 269
Thompson, R. Campbell, 344, 346
Thomson, George, 661
Thomson, Samuel, 268
Thorndike, Lynn, 81-87, 257-260
Thoth, 1
de Thou, J. A., 822, 827, 828, 834
Tibbon, Mose ibn, 337
van Tienhoven, Cornelis, 723
Tillotson, *Divine*, 367
Tintoretto, 294, 295
Tissot, Simon André, 655
Togno, J., 815
Tollet, C., 579
Tomitanus, Bernardinus, 588
Tommaso di Modena, 274
Toner, Joseph M., 734, 743, 744
Tonson, Jacob, 368
Torella, 596
Torkillus, Reorus, 720
Totagamuwe Sri Rahula Thera the Great Poet, 78
Toulmin, H., 751
Tournefort, 459, 460, 461, 463, 829, 834
de Tournon, *Cardinal*, 820, 826
de Tracia, John, 257-260
Traube, 649
Trelawney, Samuel, 517
Trithemius, Johannes, 749, 750
Trotzig, 725
Trudeau, E. L., 770
Tully, William, 267
Tulp, Nicholas, 741
Turck, F. B., 451
Turgienov, 222
Turner, Daniel, 265, 592, 595, 596
Turner, Philip, 267
Turner, Roy, 75, 76
Twain, Mark, 455, 456
Tyneman, Peter, 733, 734

Ullrich, Friedrich, 466
Underhill, E. P., 267
Ungar, 377
Ustimowitch, 621

Vahlen, Johannes, 144
Valaya, *Princess*, 194
Vallery-Radot, Pasteur, 152, 153
Vallery-Radot, René, 153
Vallesius, Francescus, 23
Valsalva, Antonius Maria, 49-50, 52, 55
Van Beuren, John, 573
Vanderhoof, Douglas, 775, 780
Van Laer, A. J. F., 723, 733, 734
Vanzant, 778
Vaquez, Henri, 776
Vaughan, Benjamin, 106
Vaughan, Walter, 43
Vecchio, Palma, 294, 295
Velasquez, 278, 280
Vella, Georgius, 591, 596
Venus, 92
Verbeek, Hermanus, 590
Verbeek, Johannes, 590
Verwaeck, 32
Vesalius, Andreas, 5, 61, 264, 290, 516, 545, 797, 818, 829
Veslingius, Joannes, 48
Vicq-d'Azyr, 567
Victoria, *Queen*, 554
Victorius, Benedictus, 587, 599
Vieussens, 796, 797
Villalobos, 591, 598
Vincent, George E., 172, 173, 604
da Vinci, Leonardo, (*see* Leonardo)
Viola, G., 30, 33, 34, 35, 38
Virchow, 11, 610, 621, 633, 635
Viret, 822
Virgil, 692
Visconti, Carlo, 260
Visvanathachari, 80
Vitruvius, 29, 544, 547
Volta, 10
Voynich, Wilfrid M., 335, 337
Vulcanus, 360

Wagner, 632
Wagner, Richard, 221
Wagstaffe, 807
Waldeyer, 632
Waldo, Albigence, 267
Wahl, W. H., 770
Wall, John, 523

Wallace, 243
Wallis, 519, 524
Walsdorf, 668, 680
Walsh, J., 466
von Waltershausen, Bodo Sartorius Freiherr, 355
Wangensteen, O. H., 452
Warburg, Aby, 12
Warburg, Bettina, 409
Warburton, Henry, 790, 791
Ward, John, 519, 535
Ward, R., 452
Ward, W. H., 538, 558
Warfield, 768
Warren, John, 514
Washington, George, 507
Waterhouse, *Doctor*, 514
Watteau, 277, 286
Weaver, George H., 199
Webster, James, 127
Webster, Noah, 724
Weevle, *Mr.*, 560
Weigert, Carl, 633, 634
Weigel, C., 262
Weiner, Marie, 446
Weinstein, B. Bernard, 76, 423
Weintraud, W., 115, 119
Weisberger, Siegfried, 221-229
Weiss, J., 114, 119, 440, 442
Welch, William H., 76, 152, 549, 619, 620, 630-639, 640, 644, 645, 646, 648, 649, 650, 753, 765, 779, 781
Wellius, Dominie, 732, 733
Wellman, Max, 59, 137, 139, 141, 142, 143, 144
Wells, H. G., 235
Wells, William Charles, 789-816
Welschius, 49
Welsh, C., 464, 465
Wepfer, 682, 685, 686, 688
West, Olin, 751
Wharton, Thomas, 41, 53
Whildin, John, G., 128
Whipple, G. H., 762
Whistler, 236
White, Franklin W., 452
White, Paul D., 777
Whytt, Robert, 653, 658, 670, 677, 680, 683, 684, 690, 691, 692, 695
Widmann, 582, 591, 598
Wilkins, 519, 527
Willan, R., 267, 809, 816
William, *King of England*, 534
Williams, Charles M., 267, 268
Williams, Frankwood, 421
Williams, Helen Maria, 508
Williams, John, 266
Williams, Jonathan, 106
Williams, R., 102, 103, 118
Williams, Whitridge, 70
Willis, Thomas, 432, 519, 520, 523, 526, 532, 535, 662
Willius, Frederick A., 776
Willoughby, Percival, 717
Willoughby, Westal, 268
Willson, 769
Wilmer, *Mr.*, 566
Wilson, Frank C., 136
Wilson, Frank N., 780
Wilson, James, 281
Wilson, J. Gordon, 609
Wilson, W. J., 335
Winckelmann, J. J., 261-263, 605
Winder, William Henry, 145-151, 605
Winell, 593
Winslow, C. E. -A., 266, 268, 666
Winter, *Doctor*, 658
Winthrop, 724
Wiseman, 593
Wölfflin, Heinrich, 292
Wolfe, A., 605
Wolfe, Thomas, 420
Wolfio, 788
Wollaston, W. H., 104, 118
à Wood, Anthony, 521, 522, 524, 528, 533, 535
Wren, Christopher, 519, 521, 524
Wood, Leonard, 779
Woods, Alan C., 351
Woodward, *Doctor*, 677, 678, 683, 688, 694
Woolley, C. L., 343
de Worde, Wynken, 736
Wundt, 649

Wycherley, 532
Wyman, Jeffries, 620, 626
Wyman, M., 448

Yates, John L., 376
Yeats, 235
Young, Thomas, 268, 613

Zeller, J., 821, 829, 834
von Ziemssen, H., 448
Zilboorg, Gregory, 409
Zilettus, 590
Zimmerman, Heinrich, 122
Zimmermann, E. L., 582-599
Zimmermann, Johann Georg, 653, 655, 657, 667, 673, 676, 677, 680, 682, 685, 686, 695
Zinn, 667, 675, 680
Zola, Emile, 560
Zuelzer, G., 115, 119, 764

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